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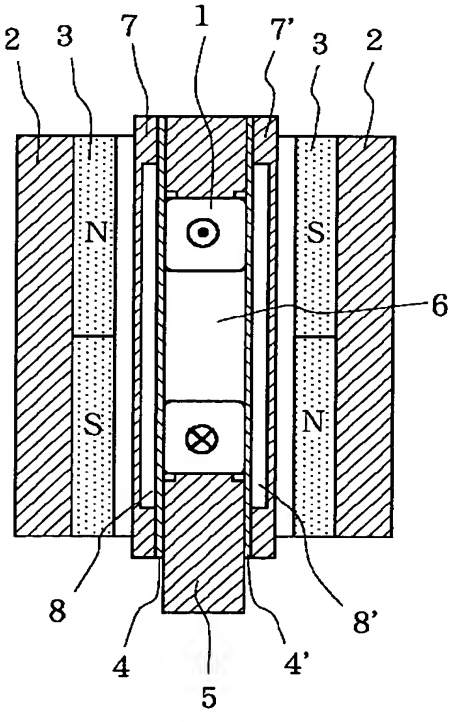
最終頁に続く

(54)【発明の名称】　リニアモータ、及びこれを有するステージ装置、露光装置

(57)【要約】
【課題】　リニアモータのコイルの発熱を押さえ、位置決め精度に及ぼす影響、構造体の熱変形、レーザ干渉計の計測誤差等をなくし、前記リニアモータを使用した優れたステージ装置や露光装置、デバイス製造方法等を提供する。
【解決手段】　コイルと該コイルを覆い内部空間に冷媒が供給されるジャケットを有するリニアモータにおいて、前記ジャケットは、内側ジャケットシート４，４’と外側ジャケットシート７，７’とからなる二重ジャケットの構造を有し、内側ジャケットシート４，４’とコイル１を密着させることにより、コイル１から発生する熱を内側ジャケットシート４，４’に伝え、前記二重ジャケットを流れる冷媒によりコイル１から発生する熱を外部に放出する機構を有する。



【特許請求の範囲】
【請求項１】　コイルと該コイルを覆い内部空間に冷媒が供給されるジャケットを有し、
前記ジャケットは、内側ジャケットと外側ジャケットとからなる二重ジャケットの構造を有することを特徴とするリニアモータ。
【請求項２】　前記内側ジャケットを構成する部材と前記コイルを密着させることにより、該コイルから発生する熱を該部材に伝え、前記二重ジャケットを流れる冷媒により該コイルから発生する熱を外部に放出する機構を有することを特徴とする請求項１に記載のリニアモータ。
【請求項３】　前記二重ジャケットの構造は、前記フレームと、該フレームを挟んで前記内側及び外側ジャケットを構成する各々二枚の部材を重ねて接合したものであることを特徴とする請求項１又は２に記載のリニアモータ。
【請求項４】　前記内側ジャケットを構成する部材は、少なくとも前記二重ジャケットを構成する前記外側ジャケットと前記フレームより熱伝導率の高い材料からなることを特徴とする請求項１～３のいずれかに記載のリニアモータ。
【請求項５】　前記二重ジャケットは、非磁性体材料、又は電気的高抵抗材料、又は絶縁体材料からなることを特徴とする請求項１～４のいずれかに記載のリニアモータ。
【請求項６】　前記リニアモータは、前記二重ジャケットを構成する部材が前記コイルを固定することを特徴とする請求項１～５のいずれかに記載のリニアモータ。
【請求項７】　前記リニアモータは、冷媒を前記外側ジャケットと前記内側ジャケットの双方に流す、若しくは前記外側ジャケットのみに流すことを特徴とする請求項１～６のいずれかに記載のリニアモータ。
【請求項８】　前記二重ジャケットに供給される冷媒は、冷却効率を上げるため、熱容量の大きな水であることを特徴とする請求項１～７のいずれかに記載のリニアモータ。
【請求項９】　前記内側ジャケットに供給される冷媒は、不活性冷媒が用いられることを特徴とする請求項１～８のいずれかに記載のリニアモータ。
【請求項１０】　前記リニアモータは、前記二重ジャケットを挟んで磁石が取り付けられたヨークが設けられていることを特徴とする請求項１～９のいずれかに記載のリニアモータ。
【請求項１１】　請求項１～１０のいずれかに記載のリニアモータを駆動機構として有することを特徴とするステージ装置。
【請求項１２】　請求項１１に記載のステージ装置を備えることを特徴とする露光装置。
【請求項１３】　請求項１２に記載の露光装置を含む各種プロセス用の製造装置群を半導体製造工場に設置する工程と、該製造装置群を用いて複数のプロセスによって半導体デバイスを製造する工程とを有することを特徴とする半導体デバイス製造方法。
【請求項１４】　前記製造装置群をローカルエリアネットワークで接続する工程と、前記ローカルエリアネットワークと前記半導体製造工場外の外部ネットワークとの間で、前記製造装置群の少なくとも１台に関する情報をデータ通信する工程とをさらに有することを特徴とする請求項１３に記載の半導体デバイス製造方法。
【請求項１５】　前記露光装置のベンダ若しくはユーザが提供するデータベースに前記外部ネットワークを介してアクセスしてデータ通信によって前記製造装置の保守情報を得る、若しくは前記半導体製造工場とは別の半導体製造工場との間で前記外部ネットワークを介してデータ通信して生産管理を行うことを特徴とする請求項１４に記載の半導体デバイス製造方法。
【請求項１６】　請求項１２に記載の露光装置を含む各種プロセス用の製造装置群と、該製造装置群を接続するローカルエリアネットワークと、該ローカルエリアネットワークから工場外の外部ネットワークにアクセス可能にするゲートウェイを有し、前記製造装置群の少なくとも１台に関する情報をデータ通信することを可能にすることを特徴とする半導体製造工場。
【請求項１７】　半導体製造工場に設置された請求項１２に記載の露光装置の保守方法であって、前記露光装置のベンダ若しくはユーザが、半導体製造工場の外部ネットワークに接続された保守データベースを提供する工程と、前記半導体製造工場内から前記外部ネットワークを介して前記保守データベースへのアクセスを許可する工程と、前記保守データベースに蓄積される保守情報を前記外部ネットワークを介して半導体製造工場側に送信する工程とを有することを特徴とする露光装置の保守方法。
【請求項１８】　請求項１２に記載の露光装置において、ディスプレイと、ネットワークインタフェースと、ネットワーク用ソフトウェアを実行するコンピュータとをさらに有し、露光装置の保守情報をコンピュータネットワークを介してデータ通信することを可能にすることを特徴とする露光装置。
【請求項１９】　前記ネットワーク用ソフトウェアは、前記露光装置が設置された工場の外部ネットワークに接続され前記露光装置のベンダ若しくはユーザが提供する保守データベースにアクセスするためのユーザインタフェースを前記ディスプレイ上に提供し、前記外部ネットワークを介して該データベースから情報を得ることを可能にすることを特徴とする請求項１８に記載の露光装置。
【発明の詳細な説明】
【０００１】

【発明の属する技術分野】本発明は、例えば露光装置や高精度加工機等の精密な位置決めを行うための装置等に好適に使用されるリニアモータに関するものである。

【０００２】

【従来の技術】半導体等の製造に用いられる露光装置や高精度加工機等で使用されるナノメートルオーダの位置決め装置では、駆動源であるリニアモータからの発熱が位置決めに悪影響を及ぼす。発熱による構造体の熱変形、若しくは空気温度の上昇による位置計測のレーザ干渉計の計測誤差等の要因によって、リニアモータの搭載された装置の位置決め精度が悪化する。例えば、１［℃］の温度変化が生じた場合、１００［mm］の低熱膨張材（熱膨張係数：1×10^{-6}）は１００［nm］だけ変形するし、また、光干渉式測長計の光路における空気温度の変化が１［℃］以下であっても測定値に１００［nm］の誤差が生じる。従って、これらの温度変化の防止策としてリニアモータの冷却、特にリニアモータから発生する熱の回収が必要となっている。

【０００３】一方、装置の高性能化に伴い、リニアモータの高出力化が要求されており、そのためにコイルに流れる電流を増やすと発熱量も大きく増大する。よって、さらなる冷却能力の増強が必要とされる。また、コイル温度の上昇によるコイル抵抗の増加やコイル線材の破損を防ぐためにも、コイルの冷却能力を高めることは重要である。

【０００４】図１１は、従来例に係る冷却手段を備えたリニアモータの構成を示す図である。同図において、コイル１とその両側のヨーク２に固定された永久磁石３により構成され、コイル１は肉薄のシート３４，３４’及びフレーム５で構成されたジャケットで覆われている。コイル１は固定具３７によってフレーム５に固定されている。ここで、ジャケットの内部空間３６に冷媒を流すことにより、コイル１からの発生熱を回収している。

【０００５】

【発明が解決しようとする課題】上記従来例では、流量を一定にしてコイルの冷却能力を上げるために、冷媒に熱の吸収効率の高いものを使うと有効であるが、反面冷媒は高圧電流の流れているコイルに直接に接しているため、活性化した冷媒であるとコイル表面の保護膜が破損し、電気的な絶縁破壊が起こり、リニアモータの機能を失う恐れがある。これを防ぐため、化学的に不活性な冷媒をコイル冷却に用いているが、一般的に不活性冷媒は熱の吸収効率が悪く、リニアモータの出力をさらに上げるため大電力を流すと、冷却能力が不足する可能性があった。

【０００６】本発明は、上記の問題に鑑みてなされたものであり、リニアモータのコイルの発熱を押さえ、位置決め精度に及ぼす影響、構造体の熱変形、レーザ干渉計の計測誤差等をなくし、前記リニアモータを使用した優れたステージ装置や露光装置、デバイス製造方法等を提供することを目的とする。

【０００７】

【問題を解決するための手段】上記目的を達成するために、本発明のリニアモータは、コイルと該コイルを覆い内部空間に冷媒が供給されるジャケットを有し、前記ジャケットは、内側ジャケットと外側ジャケットとからなる二重ジャケットの構造を有することを特徴とする。本発明においては、前記内側ジャケットを構成する部材と前記コイルを密着させることにより、該コイルから発生する熱を該部材に伝え、前記二重ジャケットを流れる冷媒により該コイルから発生する熱を外部に放出する機構を有することができる。

【０００８】また、前記二重ジャケットの構造は、前記フレームと、該フレームを挟んで前記内側及び外側ジャケットを構成する各々二枚の部材を重ねて接合したものであることが好ましい。

【０００９】また、前記内側ジャケットを構成する部材は、少なくとも前記二重ジャケットを構成する前記外側ジャケットと前記フレームより熱伝導率の高い材料からなることが好ましい。また、前記二重ジャケットは、非磁性体材料、又は電気的高抵抗材料、又は絶縁体材料からなることが好ましい。また、前記リニアモータは、前記二重ジャケットを構成する部材が前記コイルを固定することができる。また、前記リニアモータは、冷媒を前記外側ジャケットと前記内側ジャケットの双方に流す、若しくは前記外側ジャケットのみに流すことができる。

【００１０】また、前記二重ジャケットに供給される冷媒は、冷却効率を上げるため、熱容量の大きな水であることが好ましい。そして、前記内側ジャケットに供給される冷媒は、不活性冷媒が用いられることが好ましい。

【００１１】さらに、前記リニアモータは、前記二重ジャケットを挟んで磁石が取り付けられたヨークが設けられていることが好ましい。

【００１２】本発明のステージ装置は、前記リニアモータを駆動機構として有することができる。本発明の露光装置は、前記ステージ装置を備えることができる。

【００１３】本発明の露光装置による半導体デバイス製造方法は、前記露光装置を含む各種プロセス用の製造装置群を半導体製造工場に設置する工程と、該製造装置群を用いて複数のプロセスによって半導体デバイスを製造する工程とを有することができる。

【００１４】また、前記製造装置群をローカルエリアネットワークで接続する工程と、前記ローカルエリアネットワークと前記半導体製造工場外の外部ネットワークとの間で、前記製造装置群の少なくとも１台に関する情報をデータ通信する工程とをさらに有することができる。

【００１５】さらに、前記露光装置のベンダ若しくはユーザが提供するデータベースに前記外部ネットワークを介してアクセスしてデータ通信によって前記製造装置の保守情報を得る、若しくは前記半導体製造工場とは別の

半導体製造工場との間で前記外部ネットワークを介してデータ通信して生産管理を行うことができる。

【００１６】本発明の露光装置を収容する半導体製造工場は、前記露光装置を含む各種プロセス用の製造装置群と、該製造装置群を接続するローカルエリアネットワークと、該ローカルエリアネットワークから工場外の外部ネットワークにアクセス可能にするゲートウェイを有し、前記製造装置群の少なくとも１台に関する情報をデータ通信することを可能にすることができる。

【００１７】本発明の露光装置の保守方法は、半導体製造工場に設置された前記露光装置の保守方法であって、前記露光装置のベンダ若しくはユーザが、半導体製造工場の外部ネットワークに接続された保守データベースを提供する工程と、前記半導体製造工場内から前記外部ネットワークを介して前記保守データベースへのアクセスを許可する工程と、前記保守データベースに蓄積される保守情報を前記外部ネットワークを介して半導体製造工場側に送信する工程とを有することができる。

【００１８】本発明の露光装置は、前記露光装置において、ディスプレイと、ネットワークインタフェースと、ネットワーク用ソフトウェアを実行するコンピュータとをさらに有し、露光装置の保守情報をコンピュータネットワークを介してデータ通信することを可能にすることができる。

【００１９】さらに、前記ネットワーク用ソフトウェアは、前記露光装置が設置された工場の外部ネットワークに接続され前記露光装置のベンダ若しくはユーザが提供する保守データベースにアクセスするためのユーザインタフェースを前記ディスプレイ上に提供し、前記外部ネットワークを介して該データベースから情報を得ることを可能にすることができる。

【００２０】

【作用】上記構成等により、コイルの内側ジャケットに冷媒を流さないか、又は一般的に冷却能力の劣る不活性冷媒を使用してコイル表面の絶縁層にダメージを与えることなく、内側ジャケットを構成する部材にコイルから発生する熱を与え、外側ジャケットに流れる冷媒で効率よく熱を外部に放出させることができる。

【００２１】

【実施例】次に、本発明の実施例について図面を用いて詳細に説明する。

〔実施例１〕図１は、本発明の一実施例に係る単相リニタモータを表す断面図である。図２は、前記リニアモータのジャケット構成を示す分解図であり、図３は、前記リニアモータの外観を表す斜視図である。

【００２２】図１において、１は駆動用の電流が流れるコイル、２は磁気回路を構成する２つのヨーク、３は各ヨーク２に固定され異なる磁気同士が互いに対向して配置された永久磁石である。４，４’はコイル１を挟んで配置された内側ジャケットを構成する部材（シート）であり、本実施例の特徴であるコイル１に密着されている。５は２枚の内側ジャケットシート４，４’同士を支持するフレームであり、内側ジャケットシート４，４’とフレーム５によって、コイル１を内包する内側ジャケットを構成している。６は該内側ジャケットの内部空間であり、７，７’は本実施例の特徴部材である二重ジャケットの外側ジャケットを構成する部材（シート）であり、８，８’は該外側ジャケットの内部空間である。これらの二重ジャケットの構成部材がコイル１を固定している。内側ジャケットシート４，４’及び外側ジャケットシート７，７’とフレーム５との接合は、接着剤やボルト等で固定されている。フレーム５、外側ジャケットシート７，７’の材質は非磁性体材料、又は電気的高抵抗材料、又は絶縁体材料、例えば高分子樹脂材料若しくはセラミックス材料が好ましい。また、内側ジャケットシート４，４’の材質はコイル１の熱を効率良く冷却するため、非磁性体材料、又は電気的高抵抗材料、又は絶縁体材料であって、他の部材より熱伝導率の高い材料であることが好ましい。

【００２３】図２及び図３において、１０はコイル１のリード線（２本）、１１はリード線１０をジャケット内部から外部へ引出すための小孔である。この小孔１１から冷媒が漏れ出さないように、リード線１０を引き出した後に接着剤等で小孔１１が機密に封止されている。１２、１３は内側ジャケットに接続された冷媒の供給管、及び回収管である。冷媒は、供給管１２から供給されて内側ジャケット内を流れコイル１の発生熱を受け取り、回収管１３から回収される。コイル１の導線自体が直接冷媒に触れないようコイル１表面には保護膜が形成されているが、保護膜にダメージを与えないために、冷媒は液体又は気体であっても不活性冷媒を供給する。１４、１５は外側ジャケットに接続された冷媒の供給管、及び回収管である。冷媒は、供給管１４から供給されて外側ジャケット内を流れ、内側ジャケットを流れている冷媒から、内側ジャケットシート４，４’を介してコイル１の発熱を受け取ると同時に、コイル１側面が内側ジャケットシート４，４’と密着しているので、熱伝導でコイル１の発熱を直接伝え、内側ジャケットシート４，４’を介して回収管１５から回収され、外部へ放出される。外側ジャケットに供給する冷媒は、液体又は気体であってもよい。また、不活性冷媒である必要はないが、熱の冷却効率を上げるために熱容量の大きな、例えば水を流すことも好ましい。

【００２４】上記構成において、固定磁界を発生している永久磁石３の間の空間に位置するコイル１に電流を流すとローレンツ力が働き、コイル１と永久磁石３は上下方向に相対的に運動する。例えば、同図の上側半分においては、磁界は紙面の左から右方向へ、電流が紙面の奥から手前方向に流れると、電流の大きさに応じた力がコイル１には紙面の上方向へ、永久磁石３には下方向へそ

れぞれ働き、それぞれが相対的に移動する。このように、コイル１に所定の電流を流すことにより、ヨーク２及びコイル１がぞれぞれ固定されている構造物を駆動するものである。さらに、本実施例では、コイル１側（コイル１に固定された部材）は固定子、永久磁石３の保持されたヨーク２側（ヨーク２に固定された部材）は可動子であるいわゆるムービングマグネット型のリニアモータとなっているが、固定子と可動子が逆であってもよい。なお、図１では、コイル１はフレーム５に固定しているが、内側ジャケットシート４，４’に固定するようにしてもよい。

【００２５】次に、本発明の一実施例に係る多相リニアモータについて説明する。図４は、多相リニアモータ全体の構成を表す斜視図である。同図において、６１は複数のコイル列、５２はジャケット、５３はジャケット５２を固定する固定部材、６２，６２’は磁気回路を構成するヨーク、６３はヨーク６２，６２’に固定され異なる磁極同士が互いに対向して配置された永久磁石である。７３はヨーク６２，６２’を固定する固定部材である。

【００２６】上記構成において、固定磁界を発生している永久磁石６３の間の空間に位置するコイル６１に所定の電流を流すとローレンツ力が働き、コイル６１を含むジャケット５２と永久磁石６３が相対的に運動する。また、複数のコイル６１が駆動方向に配列されているため、コイル６１の個数に応じてリニアモータのストロークを変えることができる。本実施例では、コイル６１側が固定子、永久磁石６３が保持されたヨーク６２，６２’側が可動子となったいわゆるムービングマグネット型のリニアモータとなっているが、固定子と可動子が逆であってもよい。

【００２７】ジャケット５２の内部空間に温度制御された冷媒を供給して流すことにより、コイル６１に通電したときに発生する熱を回収し、コイル６１自体の温度上昇やリニアモータの搭載されている装置やその雰囲気の温度上昇を抑えている。

【００２８】以上の本実施例によれば、冷媒の圧力を上げるあるいはジャケットのシートを薄くしてもジャケットの変形や破損が抑えられるので、冷媒の流量を上げ冷却効率を向上させることができると共にジャケットの小型化が図れ、ひいてはリニアモータの推力を向上させることができる。

【００２９】［実施例２］次に、前述した実施例１に係るリニアモータを駆動機構とするステージ装置をウエハステージとして搭載した走査型露光装置の一実施例を、図５を用いて説明する。ここで、図５は、実施例１に係るリニアモータを駆動機構とするステージ装置をウエハステージとして搭載した走査型露光装置の概略図である。

【００３０】鏡筒定盤９６は、床又は基盤９１からダンパ９８を介して支持されている。また、鏡筒定盤９６は、レチクルステージ定盤９４を支持すると共に、レチクルステージ９５とウエハステージ９３の間に位置する投影光学系９７を支持している。

【００３１】ウエハステージ９３は、床又は基盤９１から支持されたステージ定盤９２上に支持され、ウエハを載置して位置決めを行う。また、レチクルステージ９５は、鏡筒定盤９６に支持されたレチクルステージ定盤９５上に支持され、回路パターンが形成されたレチクルを搭載して移動可能である。レチクルステージ９５上に搭載されたレチクルをウエハステージ９３上のウエハに露光する露光光は、照明光学系９９から発生される。

【００３２】なお、ウエハステージ９３は、レチクルステージ９５と同期して走査される。レチクルステージ９５とウエハステージ９３の走査中、両者の位置はそれぞれ干渉計によって継続的に検出され、レチクルステージ９５とウエハステージ９３の駆動部にそれぞれフィードバックされる。これによって、両者の走査開始位置を正確に同期させるとともに、定速走査領域の走査速度を高精度で制御することができる。投影光学系９７に対して両者が走査している間に、ウエハ上にはレチクルパターンが露光され、回路パターンが転写される。

【００３３】本実施例では、前述の実施例のリニアモータを駆動機構とする冷却効率良好なステージ装置をウエハステージとして用いているため、コイルにより大電力を流すことが可能となり、高速・高精度な露光が可能となる。

【００３４】本実施例によれば、リニアモータの冷却効率が上がりコイルから発生する熱を回収しているので、リニアモータからの発熱がウエハステージに伝わって温度上昇させたり、雰囲気温度を上昇させることがないため、ウエハステージの位置決め精度を飛躍的に向上させることができ、ひいては従来以上に高精度な露光転写が可能となる。

【００３５】［半導体生産システムの実施例］次に、上記説明した露光装置を利用した半導体等のデバイス（ＩＣやＬＳＩ等の半導体チップ、液晶パネル、ＣＣＤ、薄膜磁気ヘッド、マイクロマシン等）の生産システムの例を説明する。これは、半導体製造工場に設置された製造装置のトラブル対応や定期メンテナンス、若しくはソフトウェア提供等の保守サービスを、製造工場外のコンピュータネットワーク等を利用して行うものである。

【００３６】図６は、全体システムをある角度から切り出して表現したものである。図中、１０１は半導体デバイスの製造装置を提供するベンダ（装置供給メーカ）の事業所である。製造装置の実例として、半導体製造工場で使用する各種プロセス用の半導体製造装置、例えば、前工程用機器（露光装置、レジスト処理装置、エッチング装置等のリソグラフィ装置、熱処理装置、成膜装置、平坦化装置等）や後工程用機器（組立て装置、検査装置

等）を想定している。事業所１０１内には、製造装置の保守データベースを提供するホスト管理システム１０８、複数の操作端末コンピュータ１１０、これらを結んでイントラネット等を構築するローカルエリアネットワーク（ＬＡＮ）１０９を備える。ホスト管理システム１０８は、ＬＡＮ１０９を事業所の外部ネットワークであるインターネット１０５に接続するためのゲートウェイと、外部からのアクセスを制限するセキュリティ機能を備える。

【００３７】一方、１０２～１０４は、製造装置のユーザとしての半導体製造メーカの製造工場である。製造工場１０２～１０４は、互いに異なるメーカに属する工場であってもよいし、同一のメーカに属する工場（例えば、前工程用の工場、後工程用の工場等）であってもよい。各工場１０２～１０４内には、夫々、複数の製造装置１０６と、それらを結んでイントラネット等を構築するローカルエリアネットワーク（ＬＡＮ）１１１と、各製造装置１０６の稼動状況を監視する監視装置としてホスト管理システム１０７とが設けられている。各工場１０２～１０４に設けられたホスト管理システム１０７は、各工場内のＬＡＮ１１１を工場の外部ネットワークであるインターネット１０５に接続するためのゲートウェイを備える。これにより各工場のＬＡＮ１１１からインターネット１０５を介してベンダ１０１側のホスト管理システム１０８にアクセスが可能となり、ホスト管理システム１０８のセキュリティ機能によって限られたユーザだけがアクセスが許可となっている。具体的には、インターネット１０５を介して、各製造装置１０６の稼動状況を示すステータス情報（例えば、トラブルが発生した製造装置の症状）を工場側からベンダ側に通知する他、その通知に対応する応答情報（例えば、トラブルに対する対処方法を指示する情報、対処用のソフトウェアやデータ）や、最新のソフトウェア、ヘルプ情報等の保守情報をベンダ側から受け取ることができる。各工場１０２～１０４とベンダ１０１との間のデータ通信及び各工場内のＬＡＮ１１１でのデータ通信には、インターネットで一般的に使用されている通信プロトコル（ＴＣＰ／ＩＰ）が使用される。なお、工場外の外部ネットワークとしてインターネットを利用する代わりに、第三者からのアクセスができずにセキュリティの高い専用線ネットワーク（ＩＳＤＮ等）を利用することもできる。また、ホスト管理システムはベンダが提供するものに限らずユーザがデータベースを構築して外部ネットワーク上に置き、ユーザの複数の工場から該データベースへのアクセスを許可するようにしてもよい。

【００３８】さて、図７は、本実施形態の全体システムを図６とは別の角度から切り出して表現した概念図である。先の例では、それぞれが製造装置を備えた複数のユーザ工場と、該製造装置のベンダの管理システムとを外部ネットワークで接続して、該外部ネットワークを介して各工場の生産管理や少なくとも１台の製造装置の情報をデータ通信するものであった。これに対し本例は、複数のベンダの製造装置を備えた工場と、該複数の製造装置のそれぞれのベンダの管理システムとを工場外の外部ネットワークで接続して、各製造装置の保守情報をデータ通信するものである。図中、２０１は製造装置ユーザ（半導体デバイス製造メーカ）の製造工場であり、工場の製造ラインには各種プロセスを行う製造装置、ここでは例として露光装置２０２、レジスト処理装置２０３、成膜処理装置２０４が導入されている。なお、図７では、製造工場２０１は１つだけ描いているが、実際は複数の工場が同様にネットワーク化されている。工場内の各装置はＬＡＮ２０６で接続されてイントラネット等を構成し、ホスト管理システム２０５で製造ラインの稼動管理がされている。一方、露光装置メーカ２１０、レジスト処理装置メーカ２２０、成膜装置メーカ２３０等、ベンダ（装置供給メーカ）の各事業所には、それぞれ供給した機器の遠隔保守を行うためのホスト管理システム２１１，２２１，２３１を備え、これらは上述したように保守データベースと外部ネットワークのゲートウェイを備える。ユーザの製造工場内の各装置を管理するホスト管理システム２０５と、各装置のベンダの管理システム２１１，２２１，２３１とは、外部ネットワーク２００であるインターネット若しくは専用線ネットワークによって接続されている。このシステムにおいて、製造ラインの一連の製造機器の中のどれかにトラブルが起きると、製造ラインの稼動が休止してしまうが、トラブルが起きた機器のベンダからインターネット２００を介した遠隔保守を受けることで迅速な対応が可能で、製造ラインの休止を最小限に抑えることができる。

【００３９】半導体製造工場に設置された各製造装置はそれぞれ、ディスプレイと、ネットワークインタフェースと、記憶装置にストアされたネットワークアクセス用ソフトウェア並びに装置動作用のソフトウェアを実行するコンピュータを備える。記憶装置としては内蔵メモリやハードディスク、若しくはネットワークファイルサーバ等である。上記ネットワークアクセス用ソフトウェアは、専用又は汎用のウェブブラウザを含み、例えば図８に一例を示す様な画面のユーザインタフェースをディスプレイ上に提供する。各工場で製造装置を管理するオペレータは、画面を参照しながら、製造装置の機種４０１、シリアルナンバー４０２、トラブルの件名４０３、発生日４０４、緊急度４０５、症状４０６、対処法４０７、経過４０８等の情報を画面上の入力項目に入力する。入力された情報はインターネットを介して保守データベースに送信され、その結果の適切な保守情報が保守データベースから返信されディスプレイ上に提示される。また、ウェブブラウザが提供するユーザインタフェースは、さらに図示のごとくハイパーリンク機能４１０，４１１，４１２を実現し、オペレータは各項目の更

に詳細な情報にアクセスしたり、ベンダが提供するソフトウェアライブラリから製造装置に使用する最新バージョンのソフトウェアを引出したり、工場のオペレータの参考に供する操作ガイド（ヘルプ情報）を引出したりすることができる。ここで、保守データベースが提供する保守情報には、上記説明した本発明に関する情報も含まれ、また前記ソフトウェアライブラリは本発明を実現するための最新のソフトウェアも提供する。

【００４０】次に、上記説明した生産システムを利用した半導体デバイスの製造プロセスを説明する。図９は、半導体デバイスの全体的な製造プロセスのフローを示す。ステップ１（回路設計）では半導体デバイスの回路設計を行う。ステップ２（マスク製作）では設計した回路パターンを形成したマスクを製作する。一方、ステップ３（ウエハ製造）ではシリコン等の材料を用いてウエハを製造する。ステップ４（ウエハプロセス）は前工程と呼ばれ、上記用意したマスクとウエハを用いて、リソグラフィ技術によってウエハ上に実際の回路を形成する。次のステップ５（組み立て）は後工程と呼ばれ、ステップ４によって作製されたウエハを用いて半導体チップ化する工程であり、アッセンブリ工程（ダイシング、ボンディング）、パッケージング工程（チップ封入）等の組立て工程を含む。ステップ６（検査）ではステップ５で作製された半導体デバイスの動作確認テスト、耐久性テスト等の検査を行う。こうした工程を経て半導体デバイスが完成し、これを出荷（ステップ７）する。前工程と後工程はそれぞれ専用の別の工場で行い、これらの工場毎に上記説明した遠隔保守システムによって保守がなされる。また、前工程工場と後工程工場との間でも、インターネット又は専用線ネットワークを介して生産管理や装置保守のための情報がデータ通信される。

【００４１】図１０は、上記ウエハプロセスの詳細なフローを示す。ステップ１１（酸化）ではウエハの表面を酸化させる。ステップ１２（ＣＶＤ）ではウエハ表面に絶縁膜を成膜する。ステップ１３（電極形成）ではウエハ上に電極を蒸着によって形成する。ステップ１４（イオン打込み）ではウエハにイオンを打ち込む。ステップ１５（レジスト処理）ではウエハに感光剤を塗布する。ステップ１６（露光）では上記説明した露光装置によってマスクの回路パターンをウエハに焼付露光する。ステップ１７（現像）では露光したウエハを現像する。ステップ１８（エッチング）では現像したレジスト像以外の部分を削り取る。ステップ１９（レジスト剥離）ではエッチングが済んで不要となったレジストを取り除く。これらのステップを繰り返し行うことによって、ウエハ上に多重に回路パターンを形成する。各工程で使用する製造機器は上記説明した遠隔保守システムによって保守がなされているので、トラブルを未然に防ぐと共に、もしトラブルが発生しても迅速な復旧が可能で、従来に比べて半導体デバイスの生産性を向上させることができる。

【００４２】

【発明の効果】本発明によれば、二重ジャケットの構造にして内側ジャケットに不活性冷媒を流すことと並列に、内側ジャケットを構成する部材にコイル側面を密着させて、コイルから発生する熱を該部材に伝え、外側ジャケットを流れる冷媒が効率良くコイルの発熱を外部に放出することができ、総合的に冷却効率を上げることができる。その結果、コイルにより大電力を流すことが可能となり、リニアモータの推力向上によるステージ装置の高速化が実現できる。また、コイルからの発熱を少なくすることができたので、ステージ装置の熱による構造体の熱変形、レーザ干渉計の計測誤差を少なくすることができ、ステージ装置の精度向上が可能となる。

【図面の簡単な説明】

【図１】　本発明の一実施例に係る単相リニタモータを表す断面図である。

【図２】　本発明の一実施例に係るリニアモータのジャケット構成を示す分解図である。

【図３】　本発明の一実施例に係るリニアモータの外観を表す斜視図である。

【図４】　本発明の一実施例に係る多相リニアモータ全体の構成を表す斜視図である。

【図５】　実施例１に係るリニアモータを駆動機構とするステージ装置をウエハステージとして搭載した走査型露光装置の概略図である。

【図６】　本発明の一実施例に係る露光装置を含む半導体デバイスの生産システムをある角度から見た概念図である。

【図７】　本発明の一実施例に係る露光装置を含む半導体デバイスの生産システムを別の角度から見た概念図である。

【図８】　本発明の一実施例に係る露光装置を含む半導体デバイスの生産システムにおけるユーザインタフェースの具体例を示す図である。

【図９】　本発明の一実施例に係る露光装置によるデバイスの製造プロセスのフローを説明する図である。

【図１０】　本発明の一実施例に係る露光装置によるウエハプロセスを説明する図である。

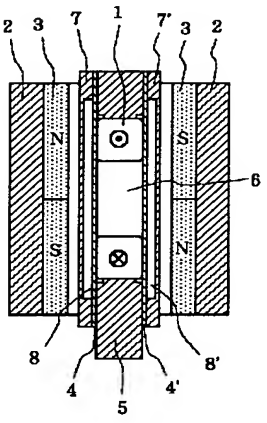
【図１１】　従来例に係る冷却手段を備えたリニアモータの構成を示す図である。

【符号の説明】

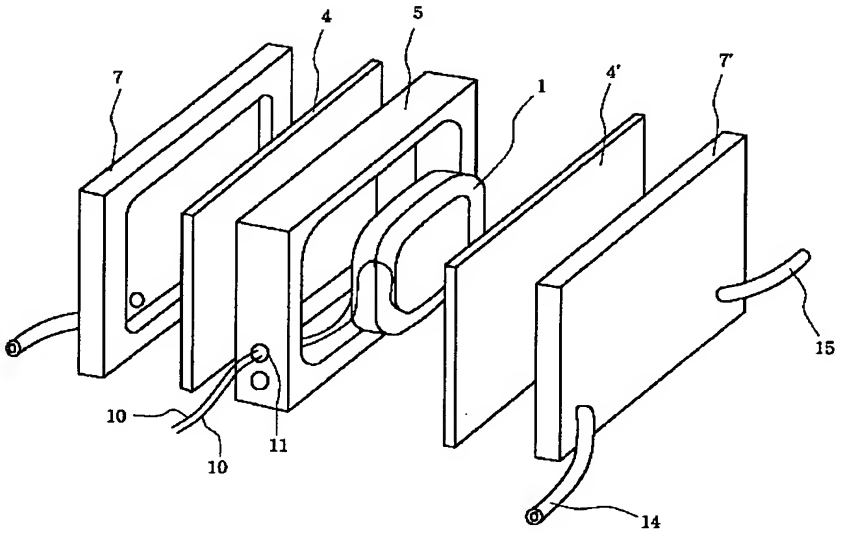
１：コイル、２：ヨーク、３：永久磁石、４，４’：内側ジャケットシート、５：フレーム、６：内側ジャケットの内部空間、７，７’：外側ジャケットシート、８，８’：外側ジャケットの内部空間、１０：リード線、１１：小孔、１２：内側ジャケットに接続された供給管、１３：内側ジャケットに接続された回収管、１４：外側ジャケットに接続された供給管、１５：外側ジャケットに接続された回収管、３４，３４’：肉薄のシート、３６：内部空間、３７：固定具、５２：ジャケット、５

３：ジャケットを固定する固定部材、６２，６２’：ヨーク、６３：永久磁石、７３：ヨークを固定する固定部材、９１：床・基盤、９２：ステージ定盤、９３：ウエハステージ、９４：レチクルステージ定盤、９５：レチクルステージ、９６：鏡筒定盤、９７：投影光学系、９９：照明光学系、１０１：ベンダの事業所、１０２，１０３，１０４：製造工場、１０５：インターネット、１０６：製造装置、１０７：工場のホスト管理システム、１０８：ベンダ側のホスト管理システム、１０９：ベンダ側のローカルエリアネットワーク（ＬＡＮ）、１１０：操作端末コンピュータ、１１１：工場のローカルエリアネットワーク（ＬＡＮ）、２００：外部ネットワーク、２０１：製造装置ユーザの製造工場、２０２：露光装置、２０３：レジスト処理装置、２０４：成膜処理装置、２０５：工場のホスト管理システム、２０６：工場のローカルエリアネットワーク（ＬＡＮ）、２１０：露光装置メーカ、２１１：露光装置メーカの事業所のホスト管理システム、２２０：レジスト処理装置メーカ、２２１：レジスト処理装置メーカの事業所のホスト管理システム、２３０：成膜装置メーカ、２３１：成膜装置メーカの事業所のホスト管理システム、４０１：製造装置の機種、４０２：シリアルナンバー、４０３：トラブルの件名、４０４：発生日、４０５：緊急度、４０６：症状、４０７：対処法、４０８：経過、４１０，４１１，４１２：ハイパーリンク機能。

【図１】



【図２】



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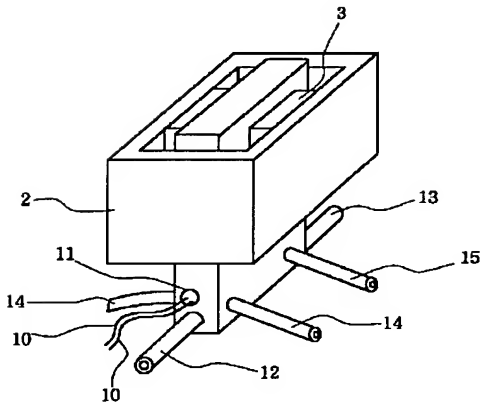

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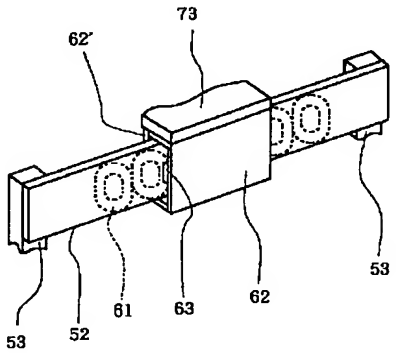
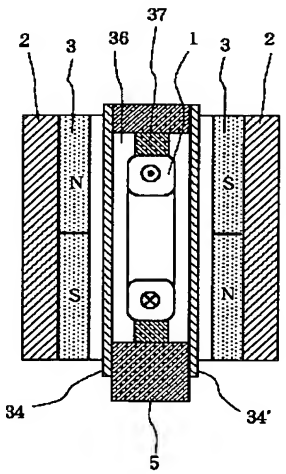
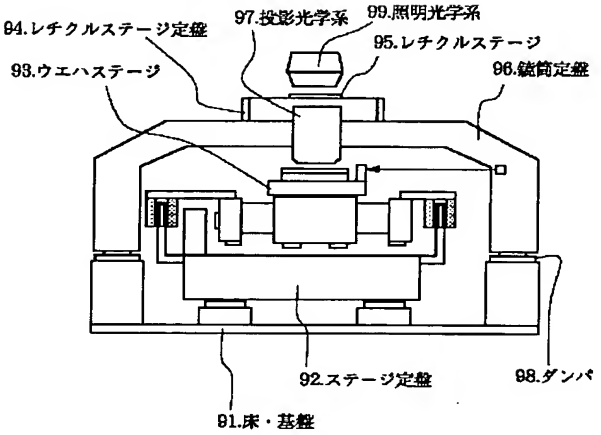


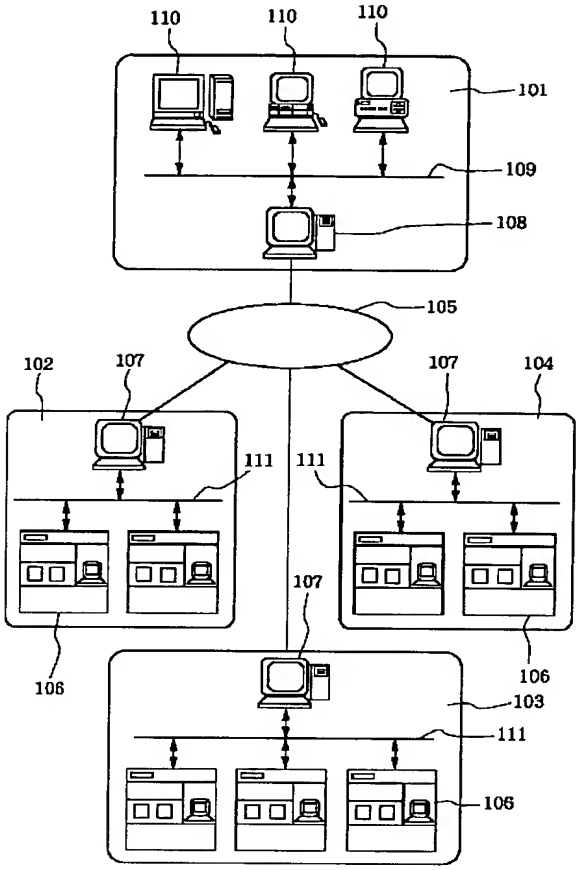
【図１１】



【図５】


94.レチクルステージ定盤
97.投影光学系
99.照明光学系
95.レチクルステージ
93.ウエハステージ
96.鏡筒定盤
92.ステージ定盤
98.ダンパ
91.床・基盤

【図６】


110
110
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105
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104
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111
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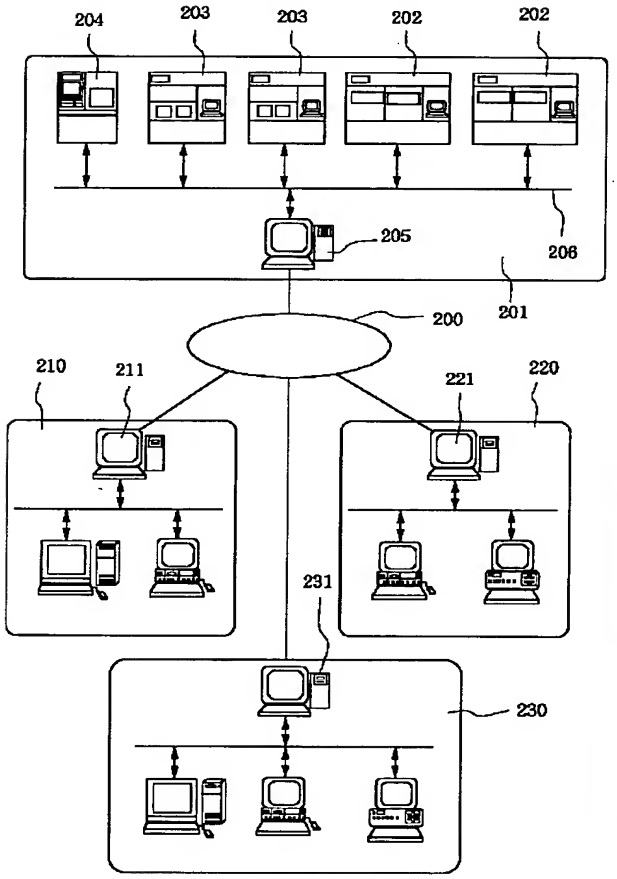
106
106
103
111
106

【図７】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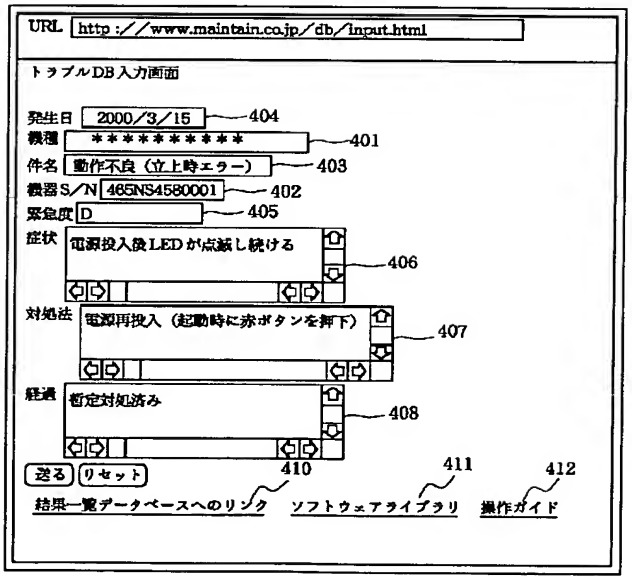
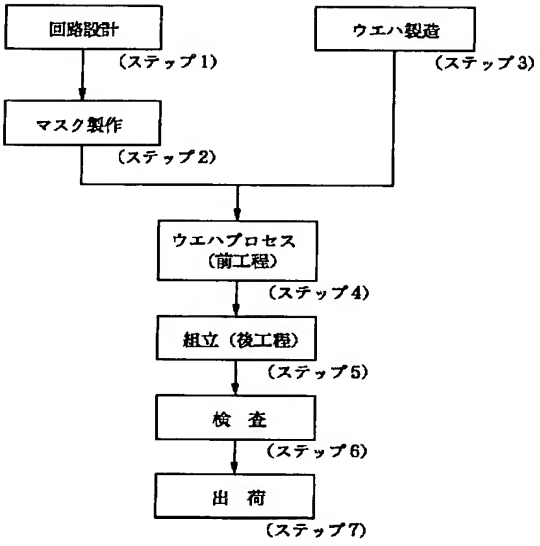
230

【図８】

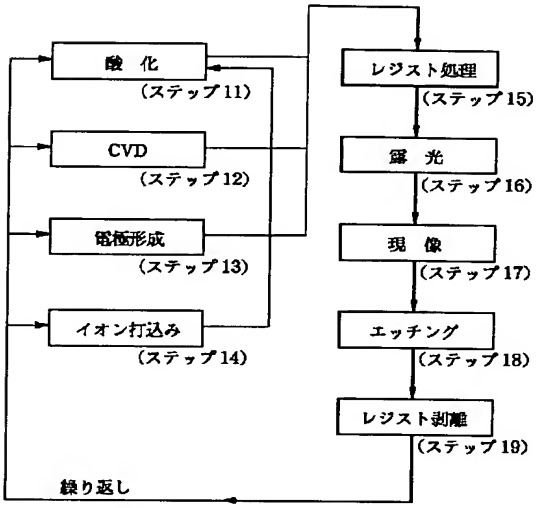

URL
http://www.maintain.co.jp/db/input.html
トラブルDB入力画面
発生日
2000/3/15
404
機種
＊＊＊＊＊＊＊＊＊＊
401
件名
動作不良（立上時エラー）
403
機器S/N
465NS4580001
402
緊急度
D
405
症状
電源投入後LEDが点滅し続ける
406
対処法
電源再投入（起動時に赤ボタンを押下）
407
経過
暫定対処済み
408
送る
リセット
410
411
412
結果一覧データベースへのリンク
ソフトウェアライブラリ
操作ガイド

【図９】



半導体デバイス製造フロー

【図１０】



ウエハプロセス

フロントページの続き

(51) Int. Cl.[7]	識別記号	ＦＩ	ﾃｰﾏｺｰﾄﾞ(参考)
		Ｈ０１Ｌ　21/30	５１５Ｇ

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CB12 CC11
5F046 AA28 BA05 CC01 CC03 CC18
DA07 DA26 DD01 DD06
5H609 BB08 BB18 PP02 PP06 PP09
QQ03 QQ04 QQ12 QQ13 QQ17
RR12 RR26 RR32 RR37 RR42
RR43 RR73
5H641 BB06 BB18 BB19 GG02 GG03
GG05 GG07 GG11 HH02 HH03
HH06 JB04 JB05 JB10

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Begin Translation:

CLAIMS

[Claim(s)]
[Claim 1] It is the linear motor which has the jacket with which a coil and this coil are covered and a refrigerant is supplied to a building envelope, and is characterized by the aforementioned jacket having the structure of the double jacket which consists of an inside jacket and an outer jacket.
[Claim 2] The linear motor according to claim 1 characterized by having the mechanism which emits the heat which tells the heat generated from this coil by sticking the member and the aforementioned coil which constitute the aforementioned inside jacket to this member, and generates the aforementioned double jacket from this coil with the flowing refrigerant outside.
[Claim 3] The structure of the aforementioned double jacket is a linear motor according to claim 1 or 2 characterized by the thing which constitute the aforementioned inside and an outer jacket on both sides of the aforementioned frame and this frame, and for which the member of two sheets is joined in piles respectively.
[Claim 4] The member which constitutes the aforementioned inside jacket is a linear motor according to claim 1 to 3 characterized by the bird clapper from material with thermal conductivity higher than the aforementioned outer jacket and the aforementioned frame which constitute the aforementioned double jacket at least.
[Claim 5] The aforementioned double jacket is a linear motor according to claim 1 to 4 characterized by the bird clapper from non-magnetic-material material, electric high electrical resistance materials, or insulator material.
[Claim 6] The aforementioned linear motor is a linear motor according to claim 1 to 5 characterized by the member which constitutes the aforementioned double jacket fixing the aforementioned coil.
[Claim 7] The aforementioned linear motor is a linear motor according to claim 1 to 6 characterized by pouring a refrigerant to the both sides of the aforementioned outer jacket and the aforementioned inside jacket, or pouring it only to the aforementioned outer jacket.
[Claim 8] The refrigerant supplied to the aforementioned double jacket is a linear motor according to claim 1 to 7 characterized by being water with big heat capacity in order to gather cooling efficiency.
[Claim 9] The refrigerant supplied to the aforementioned inside jacket is a linear motor according to claim 1 to 8 characterized by using an inactive refrigerant.

[Claim 10] The aforementioned linear motor is a linear motor according to claim 1 to 9 characterized by preparing the yoke with which the magnet was attached on both sides of the aforementioned double jacket.
[Claim 11] Stage equipment characterized by having a linear motor according to claim 1 to 10 as a drive.
[Claim 12] The aligner characterized by having stage equipment according to claim 11.
[Claim 13] The semiconductor-device manufacture method characterized by having the process which installs the manufacturing installation group containing an aligner according to claim 12 for [various] processes in a semiconductor plant, and the process which manufactures a semiconductor device by multiple processes using this manufacturing installation group.
[Claim 14] The semiconductor-device manufacture method according to claim 13 characterized by having further the process which connects the aforementioned manufacturing installation group by the Local Area Network, and the process which carries out data communication of the information about at least one set of the aforementioned manufacturing installation group between the aforementioned Local Area Network and the external network besides the aforementioned semiconductor plant.
[Claim 15] The semiconductor-device manufacture method according to claim 14 characterized by carrying out data communication through the aforementioned external network between semiconductor plants other than the aforementioned semiconductor plant, and performing a production control or it accesses the database which the vender or user of the aforementioned aligner offers through the aforementioned external network and acquires the maintenance information on the aforementioned manufacturing installation by data communication.
[Claim 16] The semiconductor plant characterized by making it possible to have the gateway made accessible and to carry out data communication of the information about at least one set of the aforementioned manufacturing installation group in the external network outside works from the Local Area Network which connects the manufacturing installation group and this manufacturing installation group for [containing an aligner according to claim 12 / various] processes, and this Local Area Network.
[Claim 17] Maintenance procedure of the aligner according to claim 12 installed in the semiconductor plant characterized by providing the following. The process which the vender or user of the aforementioned aligner provides with the maintenance database connected to the external network of a semiconductor plant. The process to which access to the aforementioned maintenance database is permitted through the aforementioned external network from the inside of the aforementioned semiconductor plant. The process which transmits the maintenance information accumulated at the aforementioned maintenance database to a semiconductor plant side through the aforementioned external network.
[Claim 18] The aligner characterized by making it possible to have further a display, a network interface, and the computer that performs software for networks in an aligner according to claim 12, and to carry out data communication of the maintenance information on an aligner through a computer network.
[Claim 19] The aforementioned software for networks is an aligner according to claim 18 characterized by making it possible to offer the user interface for accessing the maintenance database which connects with the external network of the works in which the aforementioned aligner was installed, and the vender or user of the aforementioned aligner offers on the aforementioned display, and to acquire information from this database through the aforementioned external network.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the linear motor used suitable for the equipment for performing precise positioning of an aligner, a high precision finishing machine, etc.
[0002]
[Description of the Prior Art] In the pointing device of the nano meter order used by the aligner used for manufacture of a semiconductor etc., the high precision finishing machine, etc., generation of heat from the linear motor which is a driving source has a bad influence on positioning. The positioning accuracy of the equipment with which the linear motor was carried gets worse according to factors, such as a measurement error of the laser interferometer of the position measurement by heat deformation of the structure by generation of heat, or elevation of air temperature. For example, when the temperature change of 1 [**] arises, only 100 [nm] transforms the low-fever expansion material (coefficient of thermal expansion : 1x10 -6) of 100 [mm], and even if change of the air temperature in the optical path of an optical interference formula length measurement meter is below 1 [**], the error of 100 [nm] produces it in measured value. Therefore, cooling of a linear motor, especially recovery of the heat generated from a linear motor are needed as a preventive measure of these temperature changes.
[0003] On the other hand, with highly-efficient-izing of equipment, the high increase in power of a linear motor is demanded, and if the current which flows in a coil for the reason is increased, calorific value will also increase greatly. Therefore, reinforcement of the further refrigeration capacity is needed. Moreover, in order to prevent the increase in coil resistance and the breakage of a coil wire rod by elevation of coil temperature, it is important to heighten the refrigeration capacity of a coil.
[0004] Drawing 11 is drawing showing the composition of the linear motor equipped with the cooling means concerning the conventional example. In this drawing, it is constituted by the permanent magnet 3 fixed to the coil 1 and the yoke 2 of the both sides, and the coil 1 is covered in the jacket which consisted of a sheet 34 of closing in, 34', and a frame 5. The coil 1 is being fixed to the frame 5 by the fastener 37. Here, the generating heat from a coil 1 is collected by pouring a refrigerant to the building envelope 36 of a jacket.
[0005]
[Problem(s) to be Solved by the Invention] Although it is effective if the high thing of the absorption efficiency of heat is used for a refrigerant in order to fix a flow rate and to raise the refrigeration capacity of a coil in the above-mentioned conventional example, the protective coat on the front face of a coil is damaged as it is the activated refrigerant since the opposite side refrigerant is directly in contact with the coil with which high-voltage current is flowing, electric dielectric breakdown happens, and there is a possibility of losing the function of a linear motor. Although the inactive refrigerant was chemically used for coil cooling in order to prevent this, in order that the absorption efficiency of heat might be bad and might raise the output of a linear motor further, when large power was passed, generally refrigeration capacity may have been insufficient for the inactive refrigerant.
[0006] this invention is made in view of the above-mentioned problem, presses down generation of heat of the coil of a linear motor, abolishes the influence affect positioning accuracy, heat deformation of the structure, the measurement error of a laser interferometer, etc., and aims at offering outstanding stage equipment and the outstanding aligner which used the aforementioned linear motor, the device manufacture method, etc.
[0007]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, it is characterized by for the linear motor of this invention having the jacket with which a coil and this coil are covered and a refrigerant is supplied to a building envelope, and the aforementioned jacket having the structure of the double jacket which consists of an inside jacket and an outer jacket. In this invention, by sticking the member and the aforementioned coil which constitute the aforementioned inside jacket, the heat generated from this coil can be told to this member, and it can have the mechanism which emits the heat which generates the aforementioned double jacket from this coil with the flowing refrigerant outside.

[0008] Moreover, the structure of the aforementioned double jacket has the desirable thing which constitute the aforementioned inside and an outer jacket on both sides of the aforementioned frame and this frame and for which the member of two sheets is joined in piles respectively.

[0009] Moreover, the member which constitutes the aforementioned inside jacket has material with thermal conductivity higher than the aforementioned frame to the aforementioned outer jacket which constitutes the aforementioned double jacket at least, and a desirable bird clapper. Moreover, the aforementioned double jacket has non-magnetic-material material, electric high electrical resistance materials, or insulator material to a desirable bird clapper. Moreover, the member from which the aforementioned linear motor constitutes the aforementioned double jacket can fix the aforementioned coil. Moreover, the aforementioned linear motor can pour a refrigerant to the both sides of the aforementioned outer jacket and the aforementioned inside jacket, or can pour it only to the aforementioned outer jacket.

[0010] Moreover, as for the refrigerant supplied to the aforementioned double jacket, it is desirable that it is water with big heat capacity in order to gather cooling efficiency. And as for the refrigerant supplied to the aforementioned inside jacket, it is desirable that an inactive refrigerant is used.

[0011] Furthermore, as for the aforementioned linear motor, it is desirable that the yoke with which the magnet was attached on both sides of the aforementioned double jacket is prepared.

[0012] The stage equipment of this invention can have the aforementioned linear motor as a drive. The aligner of this invention can be equipped with the aforementioned stage equipment.

[0013] The semiconductor-device manufacture method by the aligner of this invention can have the process which installs the manufacturing installation group containing the aforementioned aligner for [various] processes in a semiconductor plant, and the process which manufactures a semiconductor device by multiple processes using this manufacturing installation group.

[0014] Moreover, it can have further the process which connects the aforementioned manufacturing installation group by the Local Area Network, and the process which carries out data communication of the information about at least one set of the aforementioned manufacturing installation group between the aforementioned Local Area Network and the external network besides the aforementioned semiconductor plant.

[0015] Furthermore, or it accesses the database which the vender or user of the aforementioned aligner offers through the aforementioned external network and acquires the maintenance information on the aforementioned manufacturing installation by data communication, data communication can be carried out through the aforementioned external network between semiconductor plants other than the aforementioned semiconductor plant, and a production control can be performed.

[0016] The semiconductor plant which holds the aligner of this invention can make it

possible to have the gateway made accessible to the external network outside works, and to carry out data communication of the information about at least one set of the aforementioned manufacturing installation group to it from the Local Area Network which connects the manufacturing installation group and this manufacturing installation group for [containing the aforementioned aligner / various] processes, and this Local Area Network.
[0017] The maintenance procedure of the aligner of this invention is the maintenance procedure of the aforementioned aligner installed in the semiconductor plant. The process which the vender or user of the aforementioned aligner provides with the maintenance database connected to the external network of a semiconductor plant, It can have the process to which access to the aforementioned maintenance database is permitted through the aforementioned external network from the inside of the aforementioned semiconductor plant, and the process which transmits the maintenance information accumulated at the aforementioned maintenance database to a semiconductor plant side through the aforementioned external network.
[0018] In the aforementioned aligner, the aligner of this invention has further a display, a network interface, and the computer that performs software for networks, and can make it possible to carry out data communication of the maintenance information on an aligner through a computer network.
[0019] Furthermore, the aforementioned software for networks can offer the user interface for accessing the maintenance database which connects with the external network of the works in which the aforementioned aligner was installed, and the vender or user of the aforementioned aligner offers on the aforementioned display, and can make it possible to acquire information from this database through the aforementioned external network.
[0020]
[Function] Without giving a damage to the insulating layer on the front face of a coil by the above-mentioned composition etc. using the inactive refrigerant in which does not pour a refrigerant in the inside jacket of a coil, or refrigeration capacity is generally inferior, the heat generated from a coil can be given to the member which constitutes an inside jacket, and heat can be made to emit outside efficiently with the refrigerant which flows to an outer jacket.
[0021]
[Example] Next, the example of this invention is explained in detail using a drawing.
[Example 1] drawing 1 is a cross section showing the single phase RINITA motor concerning one example of this invention. Drawing 2 is the exploded view showing the jacket composition of the aforementioned linear motor, and drawing 3 is a perspective diagram showing the appearance of the aforementioned linear motor.
[0022] In drawing 1 , the coil with which the current for a drive in 1 flows, two yokes with which 2 constitutes a magnetic circuit, and 3 are permanent magnets with which MAG which are fixed to each yoke 2 and are different countered mutually, and they have been arranged. 4 and 4' is a member (sheet) which constitutes the inside jacket arranged on both sides of a coil 1, and it is stuck to it by the coil 1 which is the feature of this example. 5 is the inside jacket sheet 4 of two sheets, and a frame which supports 4', and constitutes the inside jacket which connotes a coil 1 by the inside jacket sheet 4, and 4' and a frame 5. 6 -- the building envelope of this inside jacket -- it is -- 7 and 7' -- the feature of this example -- it is the member (sheet) which constitutes the outer jacket of the double jacket which is a member, and 8 and 8' is the building envelope of this outer jacket The composition member of these double jackets is fixing the coil 1. Junction on the inside jacket sheet 4, 4' and the outer-jacket sheet 7, and 7' and a frame 5 is being fixed with adhesives, the bolt, etc. The quality of the material of a frame 5, the outer-jacket sheet 7, and 7' has non-magnetic-material material, electric high electrical resistance materials, insulator material, for

example, macromolecule resin material, or a desirable ceramic material. Moreover, as for the quality of the material of the inside jacket sheet 4 and 4', it is desirable that it is non-magnetic-material material, electric high electrical resistance materials, or insulator material, and is material with thermal conductivity higher than other members in order to cool the heat of a coil 1 efficiently.

[0023] In drawing 2 and drawing 3 , it is a stoma for 10 pulling out lead wire 10 to the lead wire (2) of a coil 1, and 11 pulling it out from the interior of a jacket to the exterior. After pulling out lead wire 10 so that a refrigerant may not begin to leak from this stoma 11, the stoma 11 is closed by secrecy with adhesives etc. 12 and 13 are the supply pipes and recovery pipes of the refrigerant connected to the inside jacket. A refrigerant is supplied from a supply pipe 12, flows the inside of an inside jacket, receives the generating heat of a coil 1, and are collected from the recovery pipe 13. Although the protective coat is formed in coil 1 front face so that the lead wire of a coil 1 itself cannot touch a direct refrigerant, in order not to give a damage to a protective coat, even if a refrigerant is a liquid or a gas, it supplies an inactive refrigerant. 14 and 15 are the supply pipes and recovery pipes of the refrigerant connected to the outer jacket. Since the coil 1 side has stuck a refrigerant with the inside jacket sheet 4 and 4' at the same time it receives generation of heat of a coil 1 from the refrigerant which is supplied from a supply pipe 14, flows the inside of an outer jacket, and is flowing the inside jacket through the inside jacket sheet 4 and 4', it conducts generation of heat of a coil 1 directly by heat conduction, are collected from the recovery pipe 15 through the inside jacket sheet 4 and 4', and are emitted to the exterior. The refrigerant supplied to an outer jacket may be a liquid or a gas. Moreover, although it is not necessary to be an inactive refrigerant, in order to gather the cooling efficiency of heat, heat capacity is big, for example, it is also desirable to pour water.

[0024] In the above-mentioned composition, if current is passed in the coil 1 located in the space between the permanent magnets 3 which have generated the fixed field system, a Lorentz force will work and a coil 1 and a permanent magnet 3 will exercise relatively [direction / vertical]. For example, in the top half of this drawing, if current flows in the direction of this side from the back of space rightward from the left of space, the force according to the size of current will work a magnetic field to above [of space] in a coil 1, and it works downward to a permanent magnet 3, respectively, and each moves relatively. Thus, the structure with which ******** fixation of a yoke 2 and the coil 1 is carried out is driven by passing predetermined current in a coil 1. Furthermore, in this example, a coil 1 side (member fixed to the coil 1) may have a stator and a reverse needle, although the yoke 2 side (member fixed to the yoke 2) with which the stator and the permanent magnet 3 were held serves as a so-called MUBINGU magnet type linear motor which is a needle. In addition, although it is fixing to a frame 5, you may make it fix a coil 1 to the inside jacket sheet 4 and 4' in drawing 1 .

[0025] Next, the polyphase linear motor concerning one example of this invention is explained. Drawing 4 is a perspective diagram showing the composition of the whole polyphase linear motor. In this drawing, the yoke with which holddown-member [to which the coil train of plurality / 61 / and 52 fix a jacket to, and 53 fixes a jacket 52], 62, and 62' constitutes a magnetic circuit, and 63 are a yoke 62 and a permanent magnet with which magnetic poles which are fixed to 62' and are different countered mutually, and they have been arranged. 73 is a yoke 62 and a holddown member which fixes 62'.

[0026] In the above-mentioned composition, if predetermined current is passed in the coil 61 located in the space between the permanent magnets 63 which have generated the fixed field system, a Lorentz force will work, and the jacket 52 and permanent magnet 63 containing a coil 61 exercise relatively. Moreover, since two or more coils 61 are arranged by the driving direction, according to the number of a coil 61, the stroke of a linear motor is

changeable. A stator and a needle may be reverse although the coil 61 side serves as a linear motor of a stator, the yoke 62 with which the permanent magnet 63 was held, and the so-called MUBINGU magnet type with which 62' side became a needle in this example.
[0027] By supplying and pouring the refrigerant by which the temperature control was carried out to the building envelope of a jacket 52, the heat generated when it energizes in a coil 61 is collected, and the temperature rise of the equipment with which the temperature rise of coil 61 the very thing and the linear motor are carried, or its atmosphere is stopped.
[0028] Since according to the above this example deformation and breakage of a jacket are suppressed even if it makes the sheet of a jacket thin, or it raises the pressure of a refrigerant, while being able to raise the flow rate of a refrigerant and being able to raise cooling efficiency, the miniaturization of a jacket can be attained, as a result the thrust of a linear motor can be raised.
[0029] [An example 2], next one example of the scanned type aligner which carried the stage equipment which uses as a drive the linear motor concerning the example 1 mentioned above as a wafer stage are explained using drawing 5 . Here, drawing 5 is the schematic diagram of the scanned type aligner which carried the stage equipment which uses the linear motor concerning an example 1 as a drive as a wafer stage.
[0030] The lens-barrel surface plate 96 is supported through the damper 98 from the floor or the base 91. Moreover, the lens-barrel surface plate 96 is supporting the projection optical system 97 located between a reticle stage 95 and the wafer stage 93 while supporting the reticle-stage surface plate 94.
[0031] The wafer stage 93 is supported on the stage surface plate 92 supported from the floor or the base 91, and positions by laying a wafer. Moreover, a reticle stage 95 can be supported on the reticle-stage surface plate 95 supported by the lens-barrel surface plate 96, can carry the reticle in which the circuit pattern was formed, and can be moved. The exposure light which exposes the reticle carried on the reticle stage 95 to the wafer on the wafer stage 93 is generated from the lighting optical system 99.
[0032] In addition, the wafer stage 93 is scanned synchronizing with a reticle stage 95. During the scan of a reticle stage 95 and the wafer stage 93, by the interferometer, both position is detected continuously, respectively and is fed back to the mechanical component of a reticle stage 95 and the wafer stage 93, respectively. While synchronizing both scanning starting position correctly, the scan speed of a fixed-speed scanning field is controllable by this with high degree of accuracy. While both are scanning to a projection optical system 97, a reticle pattern is exposed on a wafer and a circuit pattern is imprinted.
[0033] In this example, since the stage equipment with good cooling efficiency which uses the linear motor of the above-mentioned example as a drive is used as a wafer stage, it becomes possible to pass large power with a coil, and high-speed and highly precise exposure is attained.
[0034] Since the heat which the cooling efficiency of a linear motor goes up and is generated from a coil is collected according to this example, and generation of heat from a linear motor gets across to a wafer stage, and does not carry out a temperature rise or does not raise ambient temperature, the positioning accuracy of a wafer stage can be raised by leaps and bounds, as a result a highly precise exposure imprint than before is attained.
[0035] The example of the production system of devices (semiconductor chips, such as IC and LSI, a liquid crystal panel, CCD, the thin film magnetic head, micro machine, etc.), such as a semiconductor using the [example of a semiconductor production system], next the aligner which gave [above-mentioned] explanation, is explained. This performs maintenance service, such as trouble correspondence of the manufacturing installation installed in the semiconductor plant, and a fixed maintenance or software offer, using the computer network besides a plant etc.

[0036] Drawing 6 cuts down and expresses a whole system from a certain angle. 101 are the place of business of the vender (equipment supply maker) which offers the manufacturing installation of a semiconductor device among drawing. As an example of a manufacturing installation, the semiconductor fabrication machines and equipment for [various] processes (assembly equipment, test equipment, etc.) used by the semiconductor plant, for example, the devices for last processes (lithography equipments, such as an aligner, a photo lithography processor, and an etching system, a thermal treatment equipment, membrane formation equipment, flattening equipment, etc.) and the devices for back processes, are assumed. In a place of business 101, it has the host managerial system 108 which offers the maintenance database of a manufacturing installation, two or more operating station computers 110, and Local Area Network (LAN) 109 which connects these and builds intranet etc. The host managerial system 108 is equipped with the security function to restrict the gateway for connecting LAN109 to the Internet 105 which is the external network of a place of business, and access from the outside.
[0037] On the other hand, 102-104 are the plants of the semiconductor manufacture maker as a user of a manufacturing installation. Plants 102-104 may be the works belonging to a mutually different maker, and may be the works (for example, works for last processes, works for back processes, etc.) belonging to the same maker. In each works 102-104, the host managerial system 107 is formed as two or more manufacturing installations 106, Local Area Network (LAN) 111 which connects them and builds intranet etc., and supervisory equipment which supervises the operation situation of each manufacturing installation 106, respectively. The host managerial system 107 formed in each works 102-104 is equipped with the gateway for connecting LAN111 in each works to the Internet 105 which is the external network of works. Access becomes possible from LAN111 of each works through the Internet 105 at the host managerial system 108 by the side of a vender 101 by this, and access is [the user restricted by the security function of the host managerial system 108] permitted. The status information (for example, symptom of the manufacturing installation which the trouble generated) which shows the operation situation of each manufacturing installation 106 is specifically notified to a vender side from a works side through the Internet 105, and also maintenance information, such as response information (for example, information, software and data for management which direct the solution for a trouble) corresponding to the notice, and the newest software, help information, is receivable from a vender side. The communications protocol (TCP/IP) currently generally used by the Internet is used for the data communication between each works 102-104 and a vender 101, and the data communication in LAN111 in each works. In addition, the high dedicated line networks (ISDN etc.) of security can also be used instead of using the Internet as an external network outside works, without the ability performing access from a third person. Moreover, what [not only] a vender offers but a user builds a database, a host managerial system places it on an external network, and you may make it permit access to this database from two or more works of a user.
[0038] Now, drawing 7 is the conceptual diagram which cut down and expressed this whole operation form system from the angle different from drawing 6 . In the previous example, each was what connects two or more user works equipped with the manufacturing installation, and the managerial system of the vender of this manufacturing installation in an external network, and carries out data communication of the production control of each works, or the information on at least one set of a manufacturing installation through this external network. On the other hand, this example connects works equipped with the manufacturing installation of two or more venders, and the managerial system of each vender of two or more of these manufacturing installations in the external network outside works, and carries out data communication of the maintenance information on each

manufacturing installation. Among drawing, 201 are a manufacturing installation user's (semiconductor-device manufacture maker) plant, and the aligner 202, the photo lithography processor 203, and the membrane formation processor 204 are introduced into the production line of works as an example the manufacturing installation which performs various processes, and here. In addition, in drawing 7 , although only one plant 201 is drawn, two or more works are similarly connected by network in practice. It connects by LAN206, each equipment in works constitutes intranet etc., and operation management of a production line is carried out with the host managerial system 205. On the other hand, each place of business of the aligner maker 210, the photo-lithography-processor maker 220, membrane formation equipment maker 230 grade, and a vender (equipment supply maker) is equipped with the host managerial system 211,221,231 for performing control maintenance of the device supplied, respectively, and these equip it with the gateway of a maintenance database and an external network, as mentioned above. The host managerial system 205 which manages each equipment in a user's plant, and the managerial system 211,221,231 of the vender of each equipment are connected by the Internet or the dedicated line network which is the external network 200. In this system, if a trouble occurs in one of a series of manufacture devices of a production line, although operation of a production line will stop, a prompt action is possible by receiving the control maintenance through the Internet 200 from the vender of the device by which the trouble occurred, and a pause of a production line can be suppressed to the minimum.

[0039] Each manufacturing installation installed in the semiconductor plant is equipped with the computer which performs a display, a network interface, software for network access by which the store was carried out to storage, and software for equipment operation, respectively. As storage, they are an internal memory, a hard disk or a network file server, etc. The above-mentioned software for network access offers the user interface of a screen as shows an example to drawing 8 on a display, including exclusive use or a general-purpose web browser. The operator who manages a manufacturing installation at each works inputs the information on the model 401 of manufacturing installation, a serial number 402, the subject name 403 of a trouble, the generating day 404, an urgency 405, a symptom 406, the coping-with method 407, and progress 408 grade into the input item on a screen, referring to a screen. It is transmitted to a maintenance database through the Internet, and the suitable maintenance information on the result is answered from a maintenance database, and the inputted information is shown on a display. Moreover, the user interface which a web browser offers can pull out further the operation guide (help information) with which realizes the hyperlink function 410,411,412, and, and pulls out the software of the latest version used for a manufacturing installation from the software library which a vender offers, or reference of the operator of works is presented like illustration. [that an operator accesses the still more detailed information on each item] Here, the information about this invention which gave [above-mentioned] explanation is also included in the maintenance information which a maintenance database offers, and the aforementioned software library also offers the newest software for realizing this invention.

[0040] Next, the manufacture process of the semiconductor device using the production system which gave [above-mentioned] explanation is explained. Drawing 9 shows the flow of the overall manufacture process of a semiconductor device. The circuit design of a semiconductor device is performed at Step 1 (circuit design). The mask in which the designed circuit pattern was formed is manufactured at Step 2 (mask manufacture). On the other hand, at Step 3 (wafer manufacture), a wafer is manufactured using material, such as silicon. Step 4 (wafer process) is called last process, and forms an actual circuit on a wafer with lithography technology using the mask and wafer which carried out [above-mentioned] preparation. The following step 5 (assembly) is called back process, is a process

semiconductor-chip-ized using the wafer produced by Step 4, and contains like assemblers, such as an assembly process (dicing, bonding) and a packaging process (chip enclosure). At Step 6 (inspection), the check test of the semiconductor device produced at Step 5 of operation, an endurance test, etc. are inspected. A semiconductor device is completed through such a process and this is shipped (Step 7). A last process and a back process are performed at another works of exclusive use, respectively, and maintenance is made by the control maintenance system which gave [above-mentioned] explanation for every works of these. Moreover, data communication of a production control or the information for equipment maintenance is carried out through the Internet or a dedicated line network also between last process works and back process works.

[0041] Drawing 10 shows the detailed flow of the above-mentioned wafer process. The front face of a wafer is oxidized at Step 11 (oxidization). At Step 12 (CVD), an insulator layer is formed on a wafer front face. At Step 13 (electrode formation), an electrode is formed by vacuum evaporationo on a wafer. Ion is driven into a wafer at Step 14 (ion implantation). A sensitization agent is applied to a wafer at Step 15 (resist processing). At Step 16 (exposure), printing exposure of the circuit pattern of a mask is carried out by the aligner which gave [above-mentioned] explanation at a wafer. The exposed wafer is developed at Step 17 (development). At Step 18 (etching), portions other than the developed resist image are shaved off. The resist which etching could be managed with Step 19 (resist exfoliation), and became unnecessary is removed. By carrying out by repeating these steps, a circuit pattern is formed on a wafer multiplex. Even if a trouble occurs, quick restoration can be possible for it, and the manufacture device used at each process can raise the productivity of a semiconductor device compared with the former while it prevents a trouble, since maintenance is made by the control maintenance system which gave [above-mentioned] explanation.

[0042]

[Effect of the Invention] The coil side is stuck to the member which constitutes an inside jacket, the heat generated from a coil is told to this member, and the refrigerant which flows an outer jacket can emit generation of heat of a coil outside efficiently, and can gather cooling efficiency to according to this invention, making it the structure of a double jacket and pouring an inactive refrigerant in an inside jacket, and parallel synthetically. Consequently, it becomes possible to pass large power with a coil, and improvement in the speed of the stage equipment by the improvement in a thrust of a linear motor can be realized. Moreover, since generation of heat from a coil was lessened, heat deformation of the structure by the heat of stage equipment and the measurement error of a laser interferometer can be lessened, and the improvement in precision of stage equipment is attained.

TECHNICAL FIELD

[The technical field to which invention belongs] this invention relates to the linear motor used suitable for the equipment for performing precise positioning of an aligner, a high precision finishing machine, etc.

PRIOR ART

[Description of the Prior Art] In the pointing device of the nano meter order used by the aligner used for manufacture of a semiconductor etc., the high precision finishing machine, etc., generation of heat from the linear motor which is a driving source has a bad influence on positioning. The positioning accuracy of the equipment with which the linear motor was

carried gets worse according to factors, such as a measurement error of the laser interferometer of the position measurement by heat deformation of the structure by generation of heat, or elevation of air temperature. For example, when the temperature change of 1 [**] arises, only 100 [nm] transforms the low-fever expansion material (coefficient of thermal expansion : 1x10 -6) of 100 [mm], and even if change of the air temperature in the optical path of an optical interference formula length measurement meter is below 1 [**], the error of 100 [nm] produces it in measured value. Therefore, cooling of a linear motor, especially recovery of the heat generated from a linear motor are needed as a preventive measure of these temperature changes.

[0003] On the other hand, with highly-efficient-izing of equipment, the high increase in power of a linear motor is demanded, and if the current which flows in a coil for the reason is increased, calorific value will also increase greatly. Therefore, reinforcement of the further refrigeration capacity is needed. Moreover, in order to prevent the increase in coil resistance and the breakage of a coil wire rod by elevation of coil temperature, it is important to heighten the refrigeration capacity of a coil.

[0004] Drawing 11 is drawing showing the composition of the linear motor equipped with the cooling means concerning the conventional example. In this drawing, it is constituted by the permanent magnet 3 fixed to the coil 1 and the yoke 2 of the both sides, and the coil 1 is covered in the jacket which consisted of a sheet 34 of closing in, 34', and a frame 5. The coil 1 is being fixed to the frame 5 by the fastener 37. Here, the generating heat from a coil 1 is collected by pouring a refrigerant to the building envelope 36 of a jacket.

EFFECT OF THE INVENTION

[Effect of the Invention] The coil side is stuck to the member which constitutes an inside jacket, the heat generated from a coil is told to this member, and the refrigerant which flows an outer jacket can emit generation of heat of a coil outside efficiently, and can gather cooling efficiency to according to this invention, making it the structure of a double jacket and pouring an inactive refrigerant in an inside jacket, and parallel synthetically. Consequently, it becomes possible to pass large power with a coil, and improvement in the speed of the stage equipment by the improvement in a thrust of a linear motor can be realized. Moreover, since generation of heat from a coil was lessened, heat deformation of the structure by the heat of stage equipment and the measurement error of a laser interferometer can be lessened, and the improvement in precision of stage equipment is attained.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Although it is effective if the high thing of the absorption efficiency of heat is used for a refrigerant in order to fix a flow rate and to raise the refrigeration capacity of a coil in the above-mentioned conventional example, the protective coat on the front face of a coil is damaged as it is the activated refrigerant since the opposite side refrigerant is directly in contact with the coil with which high-voltage current is flowing, electric dielectric breakdown happens, and there is a possibility of losing the function of a linear motor. Although the inactive refrigerant was chemically used for coil cooling in order to prevent this, in order that the absorption efficiency of heat might be bad and might raise the output of a linear motor further, when large power was passed, generally refrigeration capacity may have been insufficient for the inactive refrigerant.

[0006] this invention is made in view of the above-mentioned problem, presses down generation of heat of the coil of a linear motor, abolishes the influence affect positioning

accuracy, heat deformation of the structure, the measurement error of a laser interferometer, etc., and aims at offering outstanding stage equipment and the outstanding aligner which used the aforementioned linear motor, the device manufacture method, etc.

MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, it is characterized by for the linear motor of this invention having the jacket with which a coil and this coil are covered and a refrigerant is supplied to a building envelope, and the aforementioned jacket having the structure of the double jacket which consists of an inside jacket and an outer jacket. In this invention, by sticking the member and the aforementioned coil which constitute the aforementioned inside jacket, the heat generated from this coil can be told to this member, and it can have the mechanism which emits the heat which generates the aforementioned double jacket from this coil with the flowing refrigerant outside.

[0008] Moreover, the structure of the aforementioned double jacket has the desirable thing which constitute the aforementioned inside and an outer jacket on both sides of the aforementioned frame and this frame and for which the member of two sheets is joined in piles respectively.

[0009] Moreover, the member which constitutes the aforementioned inside jacket has material with thermal conductivity higher than the aforementioned frame to the aforementioned outer jacket which constitutes the aforementioned double jacket at least, and a desirable bird clapper. Moreover, the aforementioned double jacket has non-magnetic-material material, electric high electrical resistance materials, or insulator material to a desirable bird clapper. Moreover, the member from which the aforementioned linear motor constitutes the aforementioned double jacket can fix the aforementioned coil. Moreover, the aforementioned linear motor can pour a refrigerant to the both sides of the aforementioned outer jacket and the aforementioned inside jacket, or can pour it only to the aforementioned outer jacket.

[0010] Moreover, as for the refrigerant supplied to the aforementioned double jacket, it is desirable that it is water with big heat capacity in order to gather cooling efficiency. And as for the refrigerant supplied to the aforementioned inside jacket, it is desirable that an inactive refrigerant is used.

[0011] Furthermore, as for the aforementioned linear motor, it is desirable that the yoke with which the magnet was attached on both sides of the aforementioned double jacket is prepared.

[0012] The stage equipment of this invention can have the aforementioned linear motor as a drive. The aligner of this invention can be equipped with the aforementioned stage equipment.

[0013] The semiconductor-device manufacture method by the aligner of this invention can have the process which installs the manufacturing installation group containing the aforementioned aligner for [various] processes in a semiconductor plant, and the process which manufactures a semiconductor device by multiple processes using this manufacturing installation group.

[0014] Moreover, it can have further the process which connects the aforementioned manufacturing installation group by the Local Area Network, and the process which carries out data communication of the information about at least one set of the aforementioned manufacturing installation group between the aforementioned Local Area Network and the external network besides the aforementioned semiconductor plant.

[0015] Furthermore, or it accesses the database which the vender or user of the

aforementioned aligner offers through the aforementioned external network and acquires the maintenance information on the aforementioned manufacturing installation by data communication, data communication can be carried out through the aforementioned external network between semiconductor plants other than the aforementioned semiconductor plant, and a production control can be performed.
[0016] The semiconductor plant which holds the aligner of this invention can make it possible to have the gateway made accessible to the external network outside works, and to carry out data communication of the information about at least one set of the aforementioned manufacturing installation group to it from the Local Area Network which connects the manufacturing installation group and this manufacturing installation group for [containing the aforementioned aligner / various] processes, and this Local Area Network.
[0017] The maintenance procedure of the aligner of this invention is the maintenance procedure of the aforementioned aligner installed in the semiconductor plant, and mind the aforementioned external network from the process which the vender or user of the aforementioned aligner provides with the maintenance database connected to the external network of a semiconductor plant, and the inside of the aforementioned semiconductor plant. It can have the process to which access to the aforementioned maintenance database is permitted, and the process which transmits the maintenance information accumulated at the aforementioned maintenance database to a semiconductor plant side through the aforementioned external network.
[0018] In the aforementioned aligner, the aligner of this invention has further a display, a network interface, and the computer that performs software for networks, and can make it possible to carry out data communication of the maintenance information on an aligner through a computer network.
[0019] Furthermore, the aforementioned software for networks can offer the user interface for accessing the maintenance database which connects with the external network of the works in which the aforementioned aligner was installed, and the vender or user of the aforementioned aligner offers on the aforementioned display, and can make it possible to acquire information from this database through the aforementioned external network.

OPERATION

[Function] Without giving a damage to the insulating layer on the front face of a coil by the above-mentioned composition etc. using the inactive refrigerant in which does not pour a refrigerant in the inside jacket of a coil, or refrigeration capacity is generally inferior, the heat generated from a coil can be given to the member which constitutes an inside jacket, and heat can be made to emit outside efficiently with the refrigerant which flows to an outer jacket.

EXAMPLE

[Example] Next, the example of this invention is explained in detail using a drawing.
[Example 1] drawing 1 is a cross section showing the single phase RINITA motor concerning one example of this invention. Drawing 2 is the exploded view showing the jacket composition of the aforementioned linear motor, and drawing 3 is a perspective diagram showing the appearance of the aforementioned linear motor.
[0022] In drawing 1 , the coil with which the current for a drive in 1 flows, two yokes with which 2 constitutes a magnetic circuit, and 3 are permanent magnets with which MAG which are fixed to each yoke 2 and are different countered mutually, and they have been arranged. 4 and 4' is a member (sheet) which constitutes the inside jacket arranged on both

sides of a coil 1, and it is stuck to it by the coil 1 which is the feature of this example. 5 is the inside jacket sheet 4 of two sheets, and a frame which supports 4', and constitutes the inside jacket which connotes a coil 1 by the inside jacket sheet 4, and 4' and a frame 5. 6 -- the building envelope of this inside jacket -- it is -- 7 and 7' -- the feature of this example -- it is the member (sheet) which constitutes the outer jacket of the double jacket which is a member, and 8 and 8' is the building envelope of this outer jacket The composition member of these double jackets is fixing the coil 1. Junction on the inside jacket sheet 4, 4' and the outer-jacket sheet 7, and 7' and a frame 5 is being fixed with adhesives, the bolt, etc. The quality of the material of a frame 5, the outer-jacket sheet 7, and 7' has non-magnetic-material material, electric high electrical resistance materials, insulator material, for example, macromolecule resin material, or a desirable ceramic material. Moreover, as for the quality of the material of the inside jacket sheet 4 and 4', it is desirable that it is non-magnetic-material material, electric high electrical resistance materials, or insulator material, and is material with thermal conductivity higher than other members in order to cool the heat of a coil 1 efficiently.

[0023] In drawing 2 and drawing 3 , it is a stoma for 10 pulling out lead wire 10 to the lead wire (2) of a coil 1, and 11 pulling it out from the interior of a jacket to the exterior. After pulling out lead wire 10 so that a refrigerant may not begin to leak from this stoma 11, the stoma 11 is closed by secrecy with adhesives etc. 12 and 13 are the supply pipes and recovery pipes of the refrigerant connected to the inside jacket. A refrigerant is supplied from a supply pipe 12, flows the inside of an inside jacket, receives the generating heat of a coil 1, and are collected from the recovery pipe 13. Although the protective coat is formed in coil 1 front face so that the lead wire of a coil 1 itself cannot touch a direct refrigerant, in order not to give a damage to a protective coat, even if a refrigerant is a liquid or a gas, it supplies an inactive refrigerant. 14 and 15 are the supply pipes and recovery pipes of the refrigerant connected to the outer jacket. Since the coil 1 side has stuck a refrigerant with the inside jacket sheet 4 and 4' at the same time it receives generation of heat of a coil 1 from the refrigerant which is supplied from a supply pipe 14, flows the inside of an outer jacket, and is flowing the inside jacket through the inside jacket sheet 4 and 4', it conducts generation of heat of a coil 1 directly by heat conduction, are collected from the recovery pipe 15 through the inside jacket sheet 4 and 4', and are emitted to the exterior. The refrigerant supplied to an outer jacket may be a liquid or a gas. Moreover, although it is not necessary to be an inactive refrigerant, in order to gather the cooling efficiency of heat, heat capacity is big, for example, it is also desirable to pour water.

[0024] In the above-mentioned composition, if current is passed in the coil 1 located in the space between the permanent magnets 3 which have generated the fixed field system, a Lorentz force will work and a coil 1 and a permanent magnet 3 will exercise relatively [direction / vertical]. For example, in the top half of this drawing, if current flows in the direction of this side from the back of space rightward from the left of space, the force according to the size of current will work a magnetic field to above [of space] in a coil 1, and it works downward to a permanent magnet 3, respectively, and each moves relatively. Thus, the structure with which ******** fixation of a yoke 2 and the coil 1 is carried out is driven by passing predetermined current in a coil 1. Furthermore, in this example, a coil 1 side (member fixed to the coil 1) may have a stator and a reverse needle, although the yoke 2 side (member fixed to the yoke 2) with which the stator and the permanent magnet 3 were held serves as a so-called MUBINGU magnet type linear motor which is a needle. In addition, although it is fixing to a frame 5, you may make it fix a coil 1 to the inside jacket sheet 4 and 4' in drawing 1 .

[0025] Next, the polyphase linear motor concerning one example of this invention is explained. Drawing 4 is a perspective diagram showing the composition of the whole

polyphase linear motor. In this drawing, the yoke with which holddown-member [to which the coil train of plurality / 61 / and 52 fix a jacket to, and 53 fixes a jacket 52], 62, and 62' constitutes a magnetic circuit, and 63 are a yoke 62 and a permanent magnet with which magnetic poles which are fixed to 62' and are different countered mutually, and they have been arranged. 73 is a yoke 62 and a holddown member which fixes 62'.

[0026] In the above-mentioned composition, if predetermined current is passed in the coil 61 located in the space between the permanent magnets 63 which have generated the fixed field system, a Lorentz force will work, and the jacket 52 and permanent magnet 63 containing a coil 61 exercise relatively. Moreover, since two or more coils 61 are arranged by the driving direction, according to the number of a coil 61, the stroke of a linear motor is changeable. A stator and a needle may be reverse although the coil 61 side serves as a linear motor of a stator, the yoke 62 with which the permanent magnet 63 was held, and the so-called MUBINGU magnet type with which 62' side became a needle in this example.

[0027] By supplying and pouring the refrigerant by which the temperature control was carried out to the building envelope of a jacket 52, the heat generated when it energizes in a coil 61 is collected, and the temperature rise of the equipment with which the temperature rise of coil 61 the very thing and the linear motor are carried, or its atmosphere is stopped.

[0028] Since according to the above this example deformation and breakage of a jacket are suppressed even if it makes the sheet of a jacket thin, or it raises the pressure of a refrigerant, while being able to raise the flow rate of a refrigerant and being able to raise cooling efficiency, the miniaturization of a jacket can be attained, as a result the thrust of a linear motor can be raised.

[0029] [An example 2], next one example of the scanned type aligner which carried the stage equipment which uses as a drive the linear motor concerning the example 1 mentioned above as a wafer stage are explained using drawing 5 . Here, drawing 5 is the schematic diagram of the scanned type aligner which carried the stage equipment which uses the linear motor concerning an example 1 as a drive as a wafer stage.

[0030] The lens-barrel surface plate 96 is supported through the damper 98 from the floor or the base 91. Moreover, the lens-barrel surface plate 96 is supporting the projection optical system 97 located between a reticle stage 95 and the wafer stage 93 while supporting the reticle-stage surface plate 94.

[0031] The wafer stage 93 is supported on the stage surface plate 92 supported from the floor or the base 91, and positions by laying a wafer. Moreover, a reticle stage 95 can be supported on the reticle-stage surface plate 95 supported by the lens-barrel surface plate 96, can carry the reticle in which the circuit pattern was formed, and can be moved. The exposure light which exposes the reticle carried on the reticle stage 95 to the wafer on the wafer stage 93 is generated from the lighting optical system 99.

[0032] In addition, the wafer stage 93 is scanned synchronizing with a reticle stage 95. During the scan of a reticle stage 95 and the wafer stage 93, by the interferometer, both position is detected continuously, respectively and is fed back to the mechanical component of a reticle stage 95 and the wafer stage 93, respectively. While synchronizing both scanning starting position correctly, the scan speed of a fixed-speed scanning field is controllable by this with high degree of accuracy. While both are scanning to a projection optical system 97, a reticle pattern is exposed on a wafer and a circuit pattern is imprinted.

[0033] In this example, since the stage equipment with good cooling efficiency which uses the linear motor of the above-mentioned example as a drive is used as a wafer stage, it becomes possible to pass large power with a coil, and high-speed and highly precise exposure is attained.

[0034] Since the heat which the cooling efficiency of a linear motor goes up and is generated from a coil is collected according to this example, and generation of heat from a

linear motor gets across to a wafer stage, and does not carry out a temperature rise or does not raise ambient temperature, the positioning accuracy of a wafer stage can be raised by leaps and bounds, as a result a highly precise exposure imprint than before is attained.

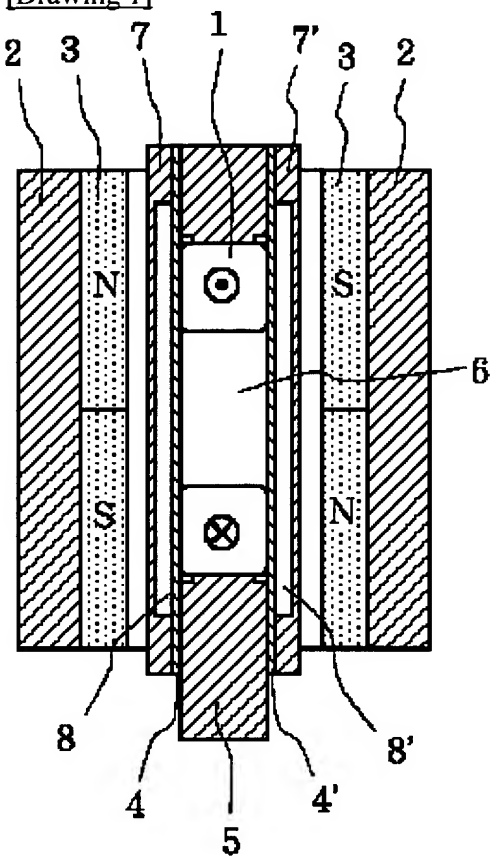
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is a cross section showing the single phase RINITA motor concerning one example of this invention.
[Drawing 2] It is the exploded view showing the jacket composition of the linear motor concerning one example of this invention.
[Drawing 3] It is a perspective diagram showing the appearance of the linear motor concerning one example of this invention.
[Drawing 4] It is a perspective diagram showing the composition of the whole polyphase linear motor concerning one example of this invention.
[Drawing 5] It is the schematic diagram of the scanned type aligner which carried the stage equipment which uses the linear motor concerning an example 1 as a drive as a wafer stage.
[Drawing 6] It is the conceptual diagram which looked at the production system of the semiconductor device containing the aligner concerning one example of this invention from a certain angle.
[Drawing 7] It is the conceptual diagram which looked at the production system of the semiconductor device containing the aligner concerning one example of this invention from another angle.
[Drawing 8] It is drawing showing the example of the user interface in the production system of the semiconductor device containing the aligner concerning one example of this invention.
[Drawing 9] It is drawing explaining the flow of the manufacture process of the device by the aligner concerning one example of this invention.
[Drawing 10] It is drawing explaining the wafer process by the aligner concerning one example of this invention.
[Drawing 11] It is drawing showing the composition of the linear motor equipped with the cooling means concerning the conventional example.
[Description of Notations]
A coil, 2:yoke, 3:permanent magnet, 4, 4' : 1: An inside jacket sheet, 5 : A building envelope [of a frame and 6:inside jacket], 7, and 7':outer-jacket sheet, 8, the building envelope of a 8':outer jacket, 10:lead wire, 11 : A stoma, 12: The supply pipe, 13 which were connected to the inside jacket : The recovery pipe connected to the inside jacket, 14 : The supply pipe connected to the outer jacket, the recovery pipe connected to 15:outer jacket, 34, the sheet of 34':closing in, 36:building envelope, 37:fastener, 52 : A jacket, 53 : The holddown member which fixes a jacket, 62, a 62':yoke, 63:permanent magnet, 73 : The holddown member which fixes a yoke, 91:floor and a base, 92:stage surface plate, 93: A wafer stage, 94:reticle-stage surface plate, 95 : A reticle stage, 96: A lens-barrel surface plate, 97:projection optical system, 99:lighting optical system, 101 : The place of business of a vender, 102,103,104 : A plant, the 105:Internet, a 106:manufacturing installation, 107 : The host managerial system of works, the host managerial system by the side of a 108:vender, 109: The Local Area Network (LAN) by the side of a vender, 110 : An operating station computer, 111 : The Local Area Network (LAN) of works, a 200:external network, 201: A manufacturing installation user's plant, a 202:aligner, 203 : A photo lithography processor, 204: A membrane formation processor, the host managerial system of 205:works, 206 : The Local Area Network of works (LAN), 210: An aligner maker, 211

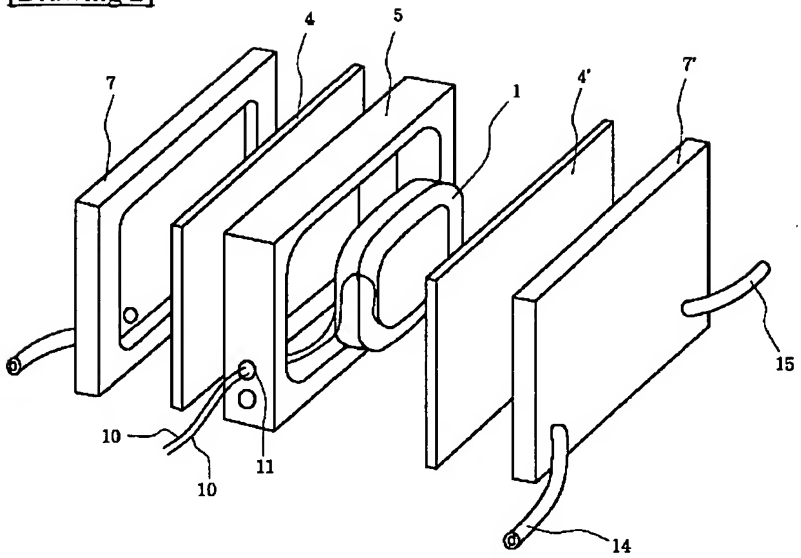
: The host managerial system of an aligner maker's place of business, 220: A photo-lithography-processor maker, 221 : The host managerial system of a photo-lithography-processor maker's place of business, 230: A membrane formation equipment maker, 231 : The host managerial system of a membrane formation equipment maker's place of business, 401: -- the model of manufacturing installation, a 402:serial number, the subject name of a 403:trouble, a 404:generating day, and 405: -- an urgency, a 406:symptom, the 407:coping-with method, 408:progress, and a 410,411,412:hyperlink function

DRAWINGS

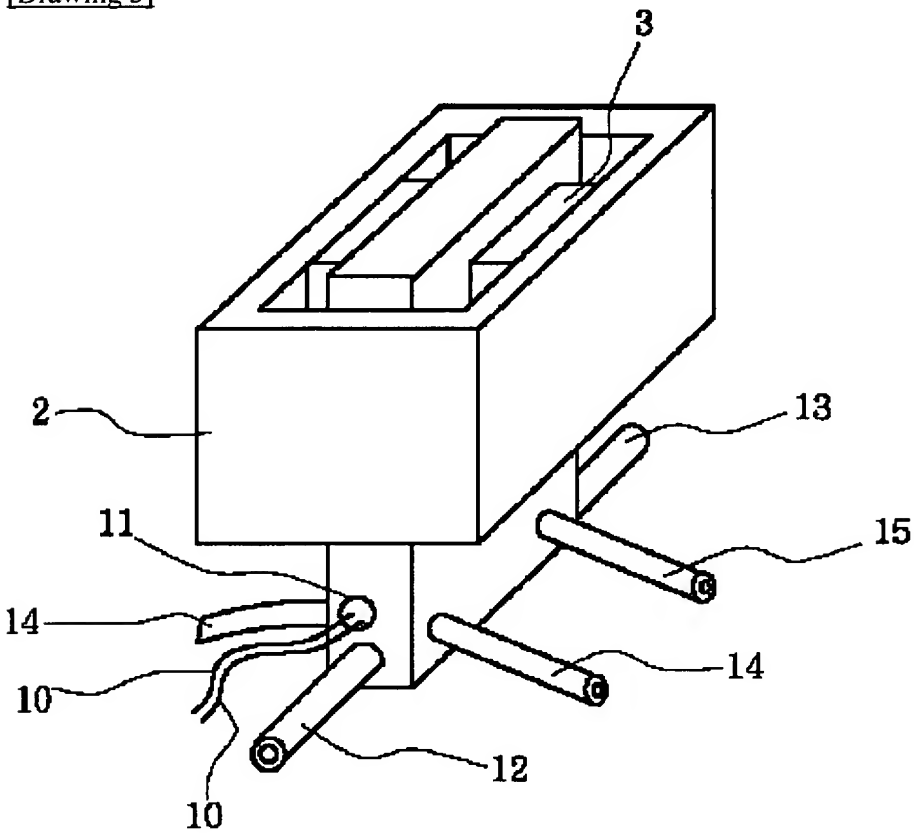
[Drawing 1]



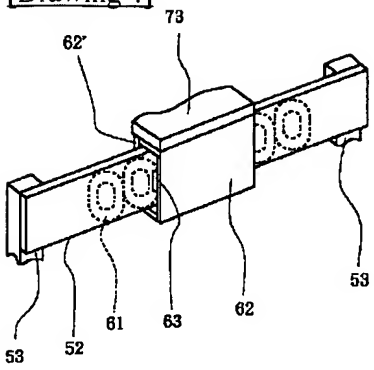
[Drawing 2]



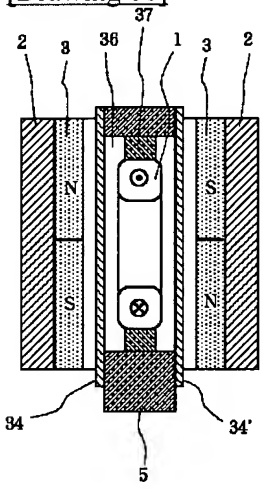
[Drawing 3]



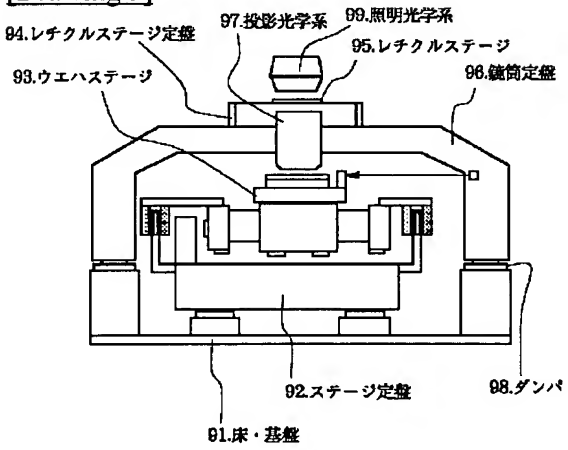
[Drawing 4]



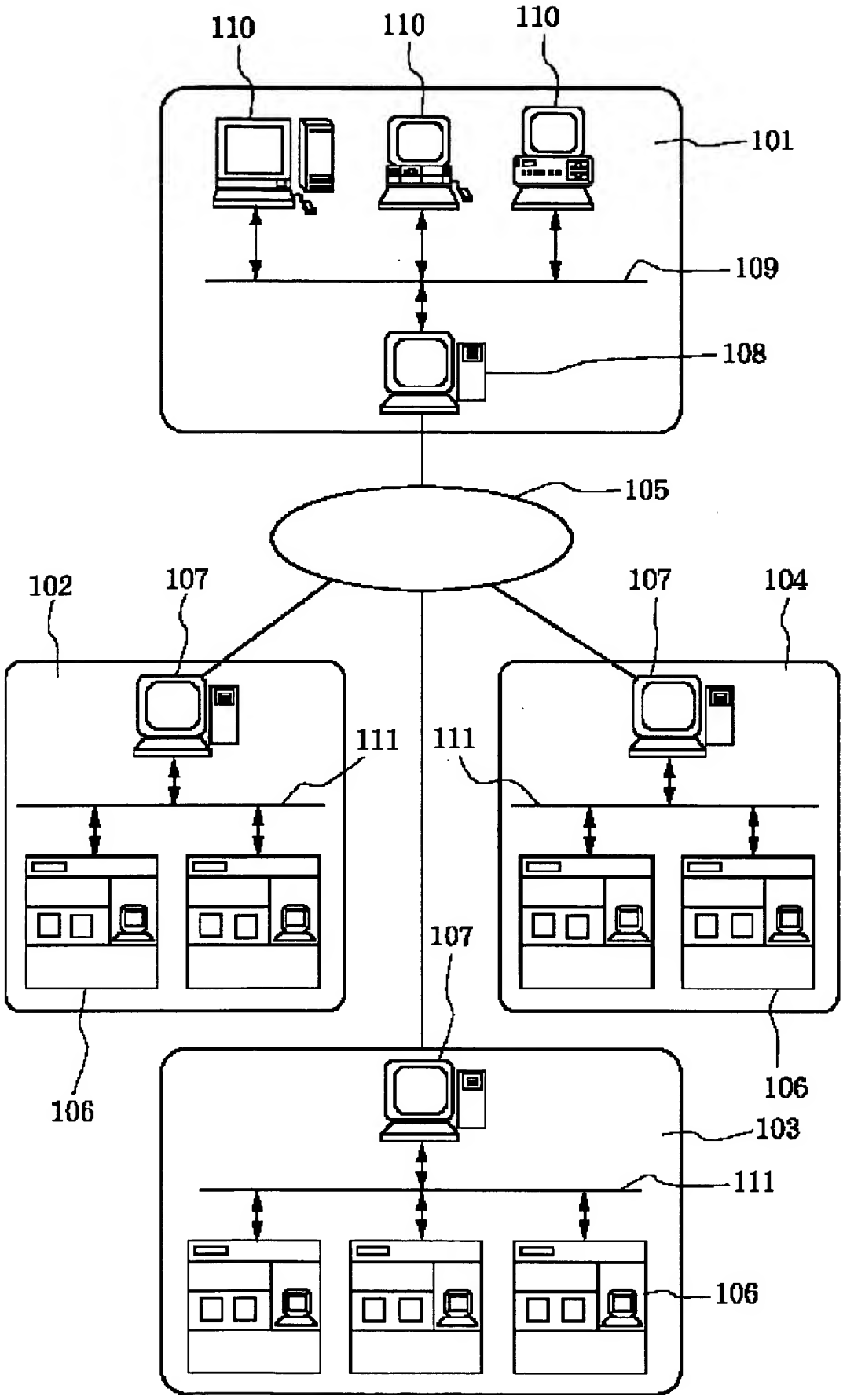
[Drawing 11]



[Drawing 5]



[Drawing 6]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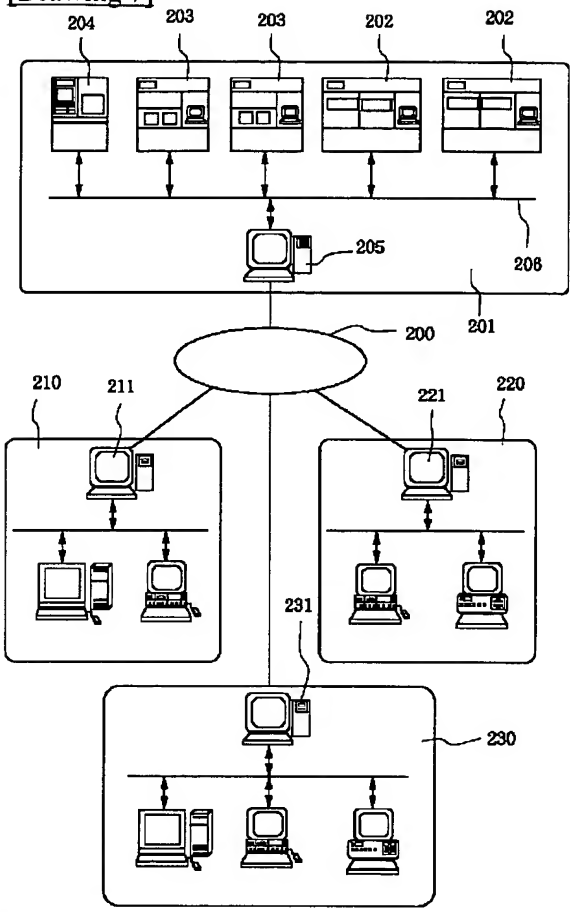
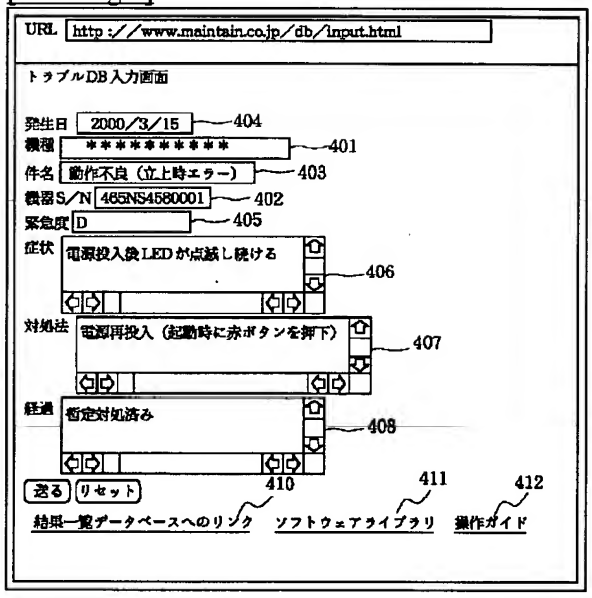
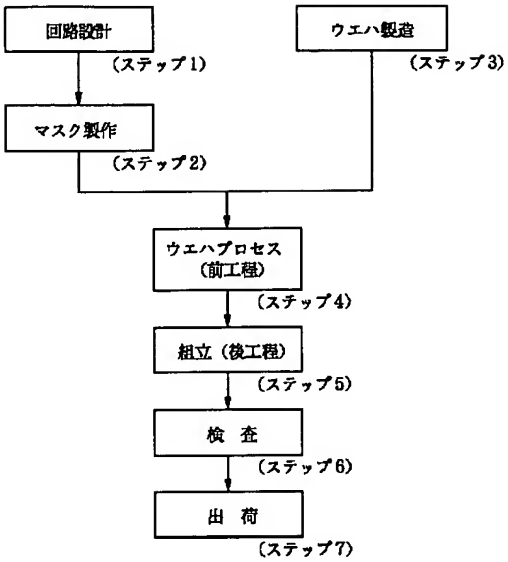
[Drawing 7]



[Drawing 8]

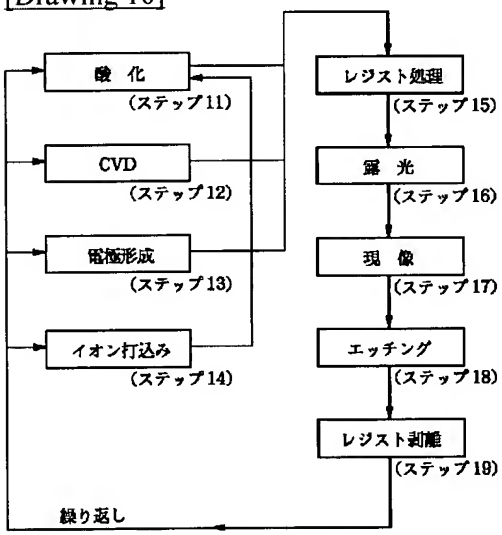


[Drawing 9]



半導体デバイス製造フロー

[Drawing 10]



ウエハプロセス

End Translation